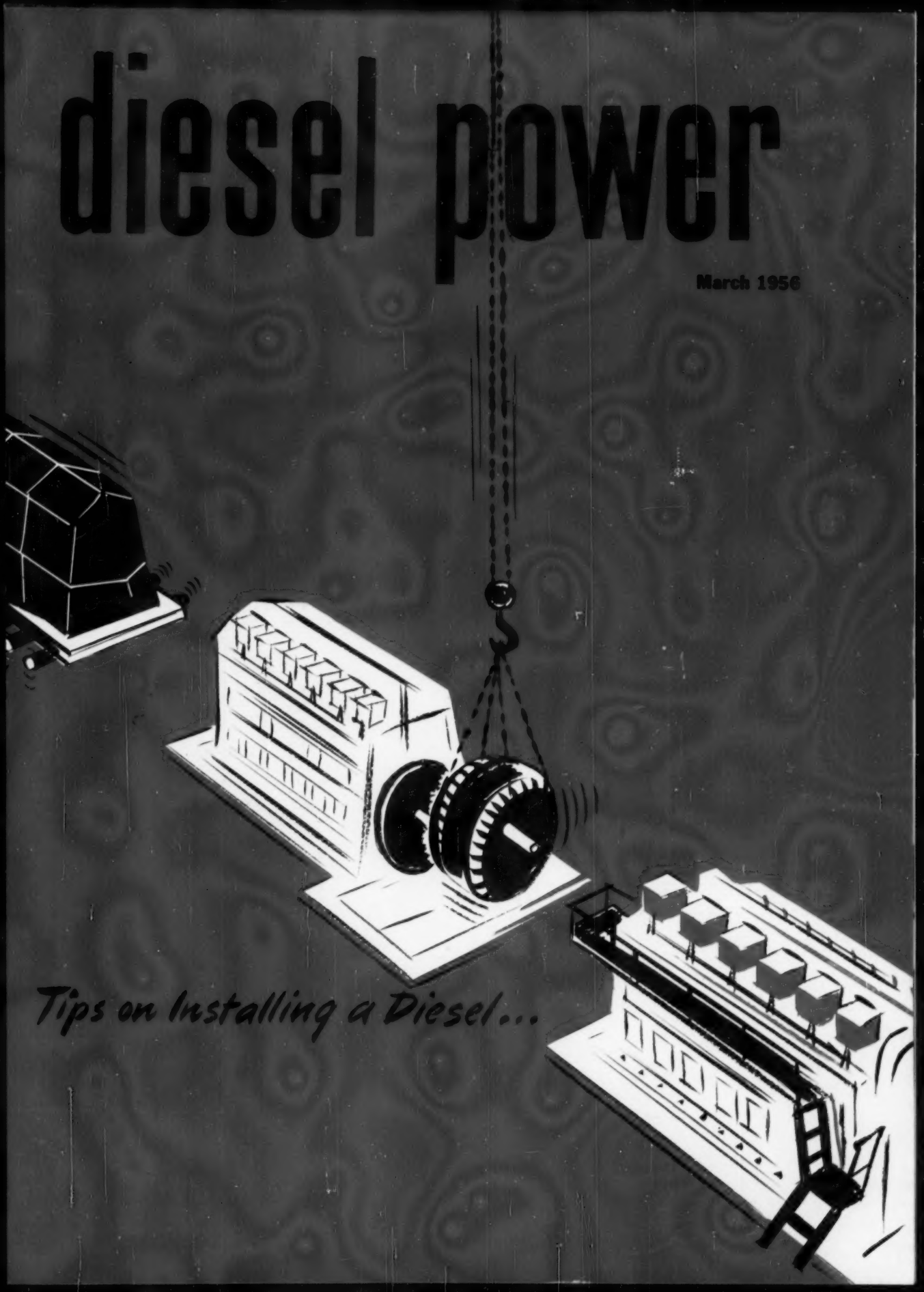
diesel power

March 1956



Tips on Installing a Diesel...

Comparison Proves Texaco Best for diesels at Vero Beach, Florida, power plant

The entire power plant at Vero Beach, Florida—including five diesels totaling over 12,000 h.p.—has been 100% Texaco-lubricated for the past two years. This confidence in Texaco began when *Texaco Ursa Oil* was tested against a leading competitive brand. Says Superintendent of Power Plant Fred Gossett:

"*Texaco Ursa Oil* definitely showed a superior ability to keep our diesels clean and free from deposits, prevent stuck rings and valves, reduce wear. We decided on *Texaco Ursa Oil* for all our diesels, and have been more than satisfied with the results—higher engine efficiency, lower fuel and maintenance costs."

Operators everywhere enjoy similar benefits. In fact—

For over 20 years, more stationary diesel h.p. in the U.S. has been lubricated with Texaco than with any other brand.

The complete line of *Texaco Ursa Oils* is especially refined and processed to assure *more power* with *less fuel* over *longer periods* between overhauls —for all diesel, gas and dual-fuel engines.

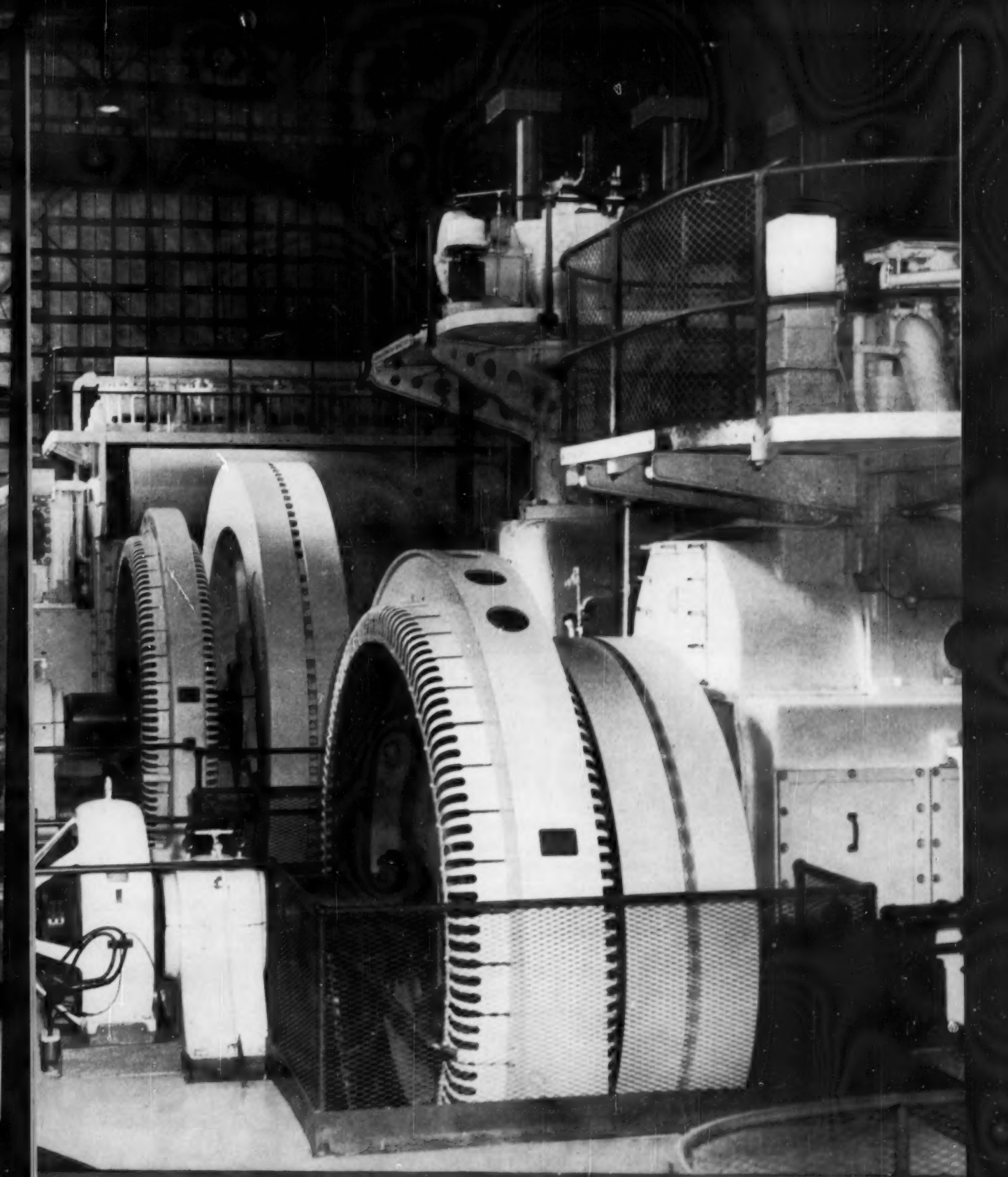
A Texaco Lubrication Engineer will gladly help you select the one best suited to *your* engines. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

DIESELS at the city power plant, Vero Beach, Florida. Three Nordberg and two McIntosh-Seymour engines—plus all plant auxiliaries—are 100% Texaco-lubricated.

TUNE IN:
TEXACO STAR THEATER
starring
JIMMY DURANTE
on TV Saturday nights.
METROPOLITAN OPERA
radio broadcasts
Saturday afternoons.

TEXACO

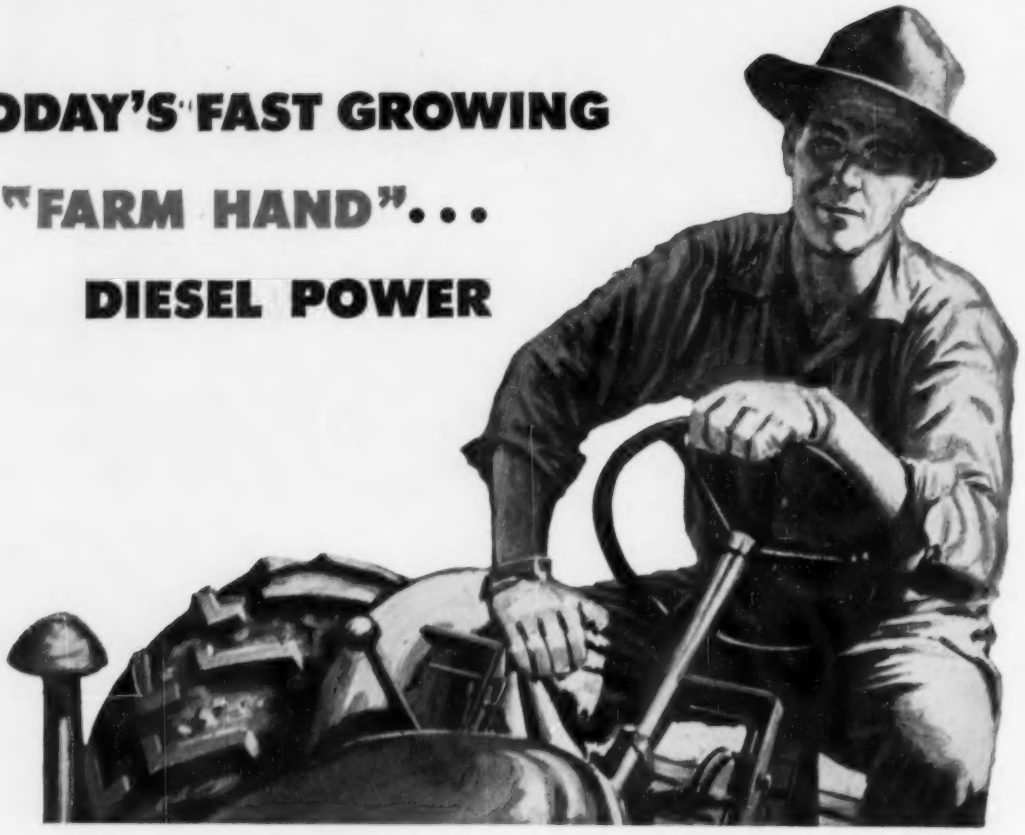
TEXACO

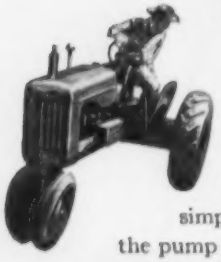


URSA OILS

FOR ALL DIESEL, GAS
AND DUAL-FUEL ENGINES

TODAY'S FAST GROWING "FARM HAND"... DIESEL POWER





In ever-increasing numbers, farmers are turning to Diesel power—for tractors, combines and other types of farm equipment. A majority of these farm Diesels, with their great labor-saving and money-saving advantages, are equipped with American Bosch fuel injection systems.

The pump that helped make this impressive swing to Diesels possible was the American Bosch PSB. This simplified single-plunger injection pump gave Diesel manufacturers the pump they needed to produce the smaller lower-cost Diesels that are making such a mark in the farm equipment, and other fields.

American Bosch now has produced over 100,000 PSB's in just the few years since it was introduced. During this time, the PSB has achieved a remarkable record for performance and dependability under the most severe operating conditions. American Bosch, Springfield 7, Massachusetts.

3292

AMERICAN BOSCH
Division of
American Bosch Arma Corporation

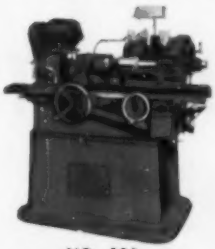
Here are some of the farm equipment manufacturers who rely on American Bosch Diesel Fuel Injection Equipment:

Allis-Chalmers
Case
Cockshutt
John Deere
International Harvester
Massey-Harris
Minneapolis-Moline
Oliver

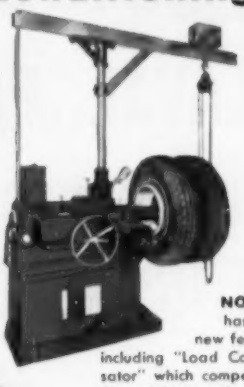
There's a *VAN NORMAN* machine

to do the finest reconditioning work on:

NO. 777-S-4
"Per-Fect-O" Cylinder Boring Bar with vacuum chip-remover. Five other models available.



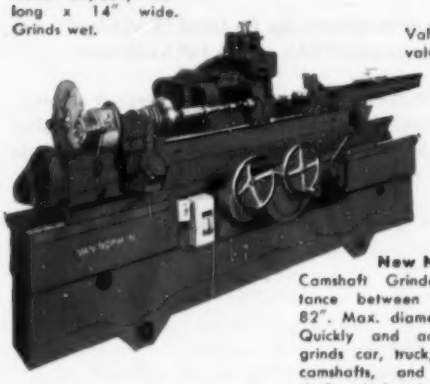
NO. 101
High Speed Piston Grinder for pistons up to 11" long, 8" diam. Smaller model available (No. 76).



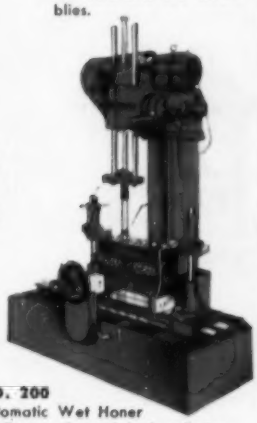
New NO. 404
has many new features, including "Load Compensator" which compensates for weight on main spindle . . . also new wet grinding attachment which permits *dustless* turning and grinding simultaneously. Takes all drum and tire assemblies.

New NO. 562
Head Grinder takes heads, blocks and manifolds. Capacity: 46" long x 14" wide. Grinds wet.

NO. 500-R
Valve Regrinder takes valves from ¼" to 1¼"; all angles from 15° to 75°. One of two models.

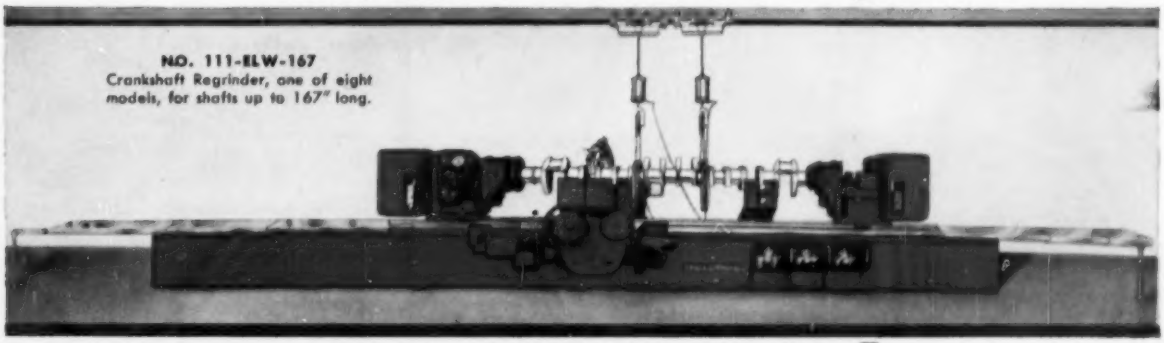


New NO. 253
Camshaft Grinder: Distance between centers, 82". Max. diameter, 9". Quickly and accurately grinds car, truck, tractor camshafts, and crankshaft main bearings.



NO. 200
Automatic Wet Honer duplicates the original cylinder wall finish of the engine manufacturers. Bore diameters 2⅞" to 8". Bore lengths up to 18". Max. stroke of hone, 18".

- Brake Drums
- Clutches
- Cylinders
- Camshafts
- Crankshafts
- Flywheels
- Heads
- Blocks
- Manifolds
- Pistons
- Piston Pins
- Connecting Rods
- Valves



NO. 111-ELW-167
Crankshaft Regrinder, one of eight models, for shafts up to 167" long.

See your Jobber or write

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Springfield 7, Massachusetts

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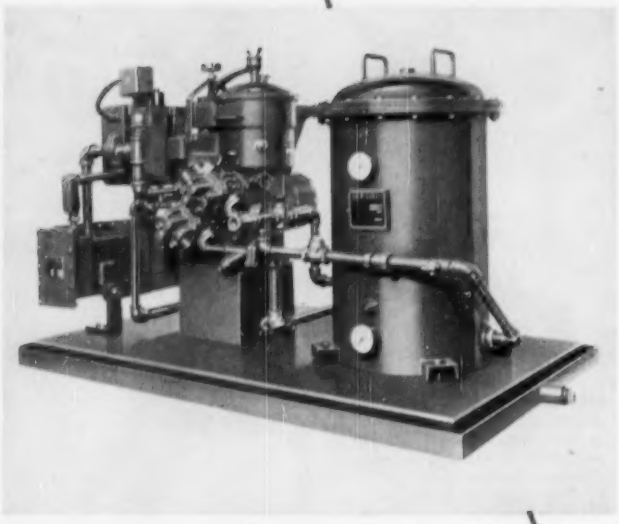
YOUR DIESEL LUBE OIL
+ A DE LAVAL "PURI-FILTER"
adds up to greater EFFICIENCY...ECONOMY...PROFITS!



Just one machine—the De Laval "Puri-Filter"—can give your diesel lube oil the *full treatment!*

The "Puri-Filter" keeps oil dry...keeps it clean... removes solid contaminants and gum-forming solids ...takes out colloidal carbon and other minute solids down to one micron (0.000039 in.) in size!

And it does all this with *one pass...without affecting oil-soluble additives!*

There's more! The De Laval "Puri-Filter" helps prevent ring sticking...prolongs oil life...stretches intervals between ring cleaning...gives you operating economy and efficiency all down the line.

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diesel power

Established in 1923 **Vol. 34, No. 3** **March, 1956**

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The Engineer's Field Report

CASE HISTORY
LUBRICANT RPM Delo Oils
FIRM Alaska Freight Lines, Seattle, Washington

RPM DELO Oil protects engines of huge Arctic Sno-Freighter—even at 68° below zero

ALASKA FREIGHT LINES uses RPM DELO Oil in engines of this huge LeTourneau Sno-Freighter for operations on the first overland supply route to the Arctic Ocean. During winter months, when temperatures fall to 68° below zero, the two 400 hp. Cummins diesels run 24 hours a day to prevent freezing. After a year of such service, crew members report RPM DELO Supercharged-1 Lubricating Oil proved completely satisfactory for all weather and performance conditions.

Using "RPM" and "RPM DELO" lubricants, exclusively supplied on the job, giant six-car train hauls 200-ton loads over 600 miles of frozen tundra from Circle, Alaska, to the Beaufort Sea. Decks of Sno-Freighter are 8½ feet off the ground, with all cars waterproofed to a height of six feet for fording streams. Engines drive generators which supply current to electric motors inside each of the 24 wheels. Operator steers only two front wheels; each unit automatically tracks car ahead.

RPM DELO LUBRICATING OILS

TRADEMARKS "RPM DELO" AND DESIGN REG. U. S. PAT. OFF.

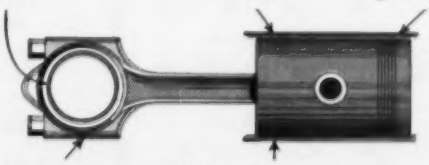
For More Information about this or other petroleum products of any kind, or the name of your nearest distributor, write or call any of the companies below.

Why RPM DELO Oils prolong engine life

Special compounds stop corrosion

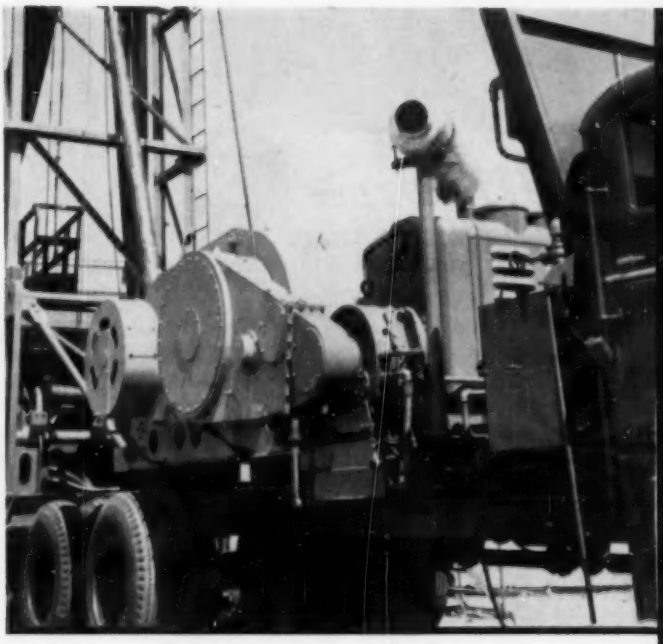
Anti-oxidant resists lacquer formation

Detergent keeps all parts clean



Metal-adhesion qualities keep oil on parts in running or idle engine—inhibitor resists foaming

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20 • STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey • THE CALIFORNIA COMPANY, Denver 1, Colorado



There's a Torcon unit to meet your job requirements

Here is a complete line of torque converters designed to meet a wide range of engine applications in all industrial fields.

The Clark Torcon unit is a three-element single stage converter of simple design, mass-produced. It is available off-the-shelf to owners and operators of equipment, as well as to manufacturers.

HORSEPOWER RANGE
. . . 15 to 600

DIAMETERS
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COMPLETE CHOICE
of options for easy fit into practically any torque transmission system.

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This helpful bulletin describes TORCON advantages . . .

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  —a patented feature. Correct combination of blade contour and angles assures smooth oil flow, for most efficient torque multiplication. **No cavitation** to cause turbulence or air pockets which impair efficiency and cause destructive wear.
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- **Individually Cast One-Piece Elements**
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CLARK EQUIPMENT COMPANY
Jackson 11, Michigan

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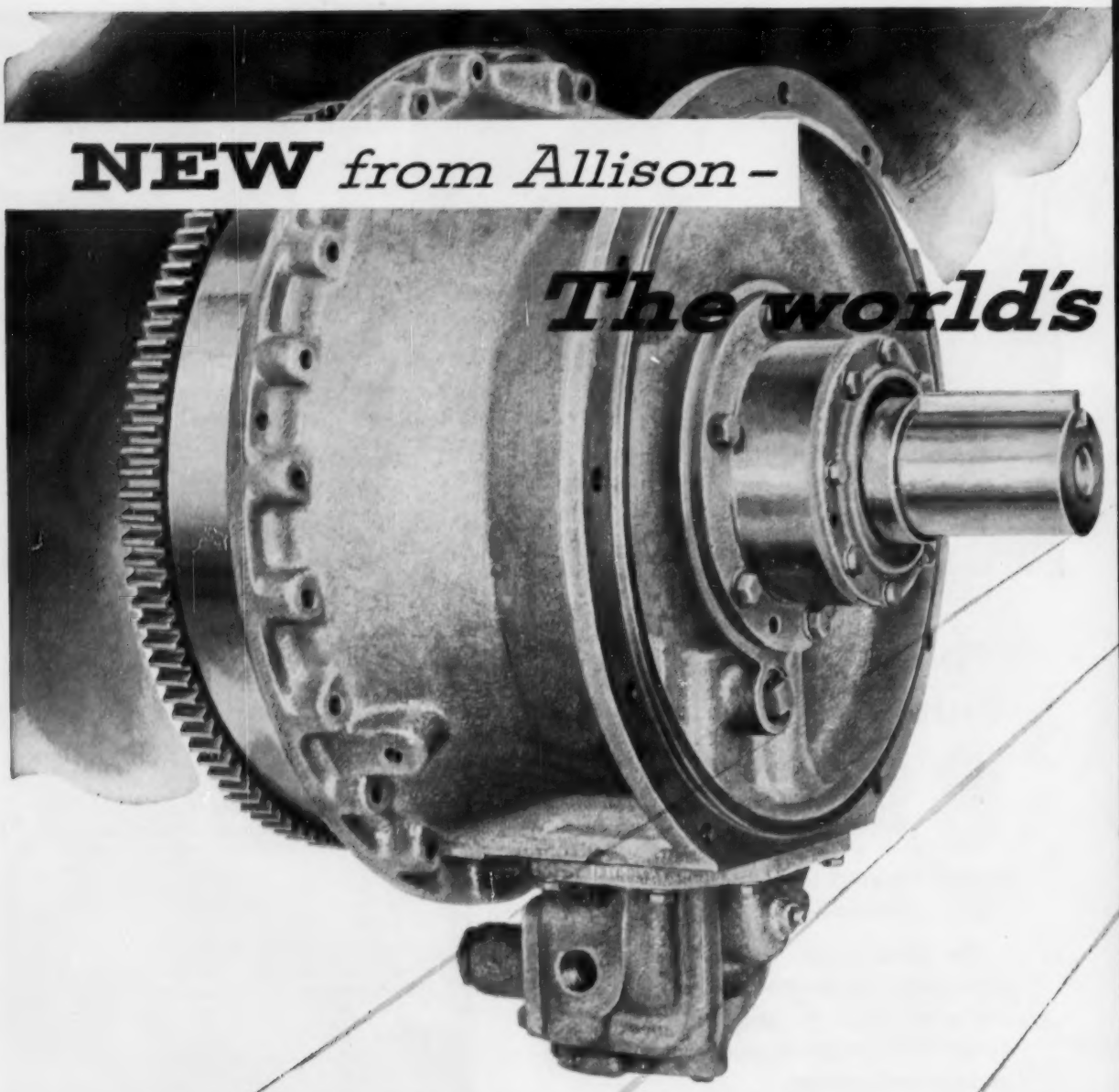
The world's



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Now, from Allison, comes the world's most versatile torque converter—the Series 500 TORQMATIC—to give you more power over a wider working range and permit you to standardize on *one* type of converter for *all* your equipment.

In *one standard housing* it gives you a choice of 4 ranges, 7 torque ratios, 100 to 350 horsepower coverage.

It's available for practically any application—automotive, industrial or a combination of both.

And it's designed for rough, tough service in scores of fields—construction, mining, oil drilling, logging, materials handling—wherever gasoline or Diesel engines are used.

This new Series 500 TORQMATIC Converter embodies every engineering advance developed by Allison in building tens of thousands of TORQMATIC Converters over the past seven years.

In many applications it will permit the use of lower horsepower engines with no reduction in *working* power because it multiplies engine torque (true measure of an engine's *working* ability) from 250% to 360%.

And the new Series 500 TORQMATIC Converter will also permit engines to run in their best speed range—transmit more power in the high-speed range.

Soon you will be able to get the TORQMATIC 500 in scrapers, off-highway trucks, log loaders, drilling and servicing rigs, shovels, cranes, graders, industrial locomotives, ditchers and shovel-type loaders made by a score or more manufacturers.

For the names of these manufacturers and full details on the TORQMATIC *Series 500 Converter write to:*

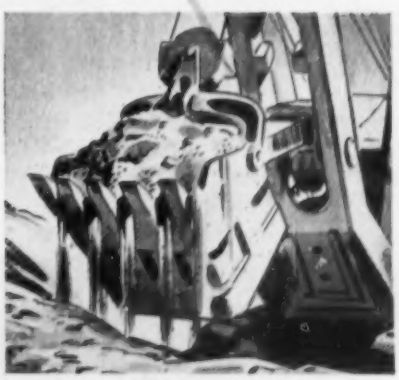
Allison Division of General Motors
Box 8945, Indianapolis 6, Indiana

HORSEPOWER

GM Allison TORQMATIC DRIVES

Graders

Cranes



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Now Warranted FOR 100,000 MILES

---or 1 year
---or 4,000 hours

Simple as ABC

— only three essential parts

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B—

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— minimizes both major and minor critical orders of vibration

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The performance and dependability of the fully patented Houdaille Viscous Torsional Vibration Damper is well known to more than 25 makers of gasoline and diesel engines.

Since its introduction 10 years ago, it has been smoothing the performance and protecting the life of *millions* of engines.

Houdaille now backs this record with a 1-year, 100,000-mile, 4,000-hour Warranty (whichever occurs first) against defects in workmanship and material . . . the *first* of its kind in the industry.

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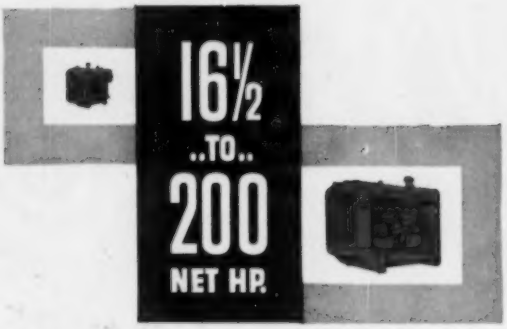
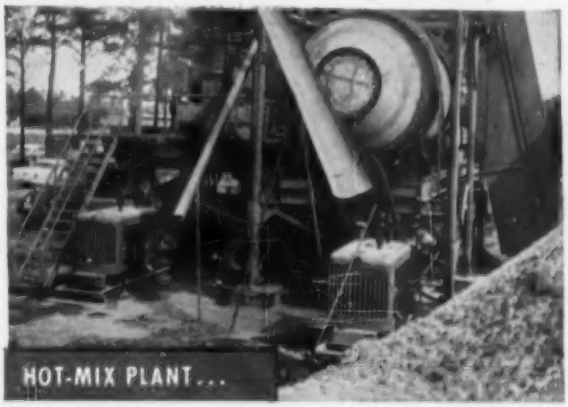


Choose your power from 18 work-proved INTERNATIONAL® UNITS!

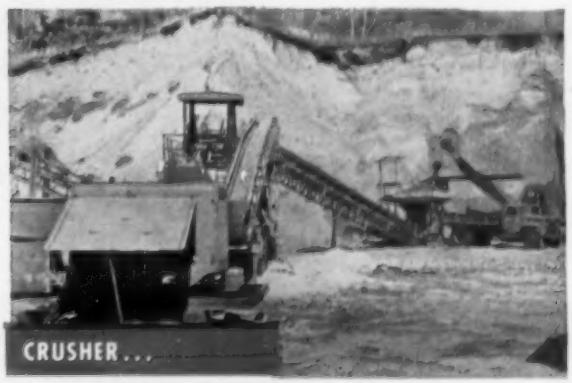
Whether you specify engines for new machines, or are working up an optional engine program, there's an International power unit size that correctly fits your needs—be it for shovel, mix plant, grader, compressor, pump, paver, or crusher. Pick any of the 6 diesel, or 12 carbureted, LPG, and gas distillate units, 16.5 to 200 net hp. You'll get heavy-duty engines with the inbuilt tinker-freedom of positive temperature control, that features full-length water jackets. You'll get special-delivery pressure lubrication through drilled passages. You'll get wear-defiant, stress-resistant, induction-hardened crankshaft bearings. You'll get many other International stay-put, extra-value features. And, *your users* will get engines proved by popularity—more heavy-duty International engines have been sold over the last 50 years than any other make.

A 190 hp International UD-24 powers this preparizer which chews up 2 miles of 24-ft pavement per 8-hour day for G. A. Watson, Barneveld, Wis. Says Watson, "I buy International power whenever I can, because their engines are dependable and their field service excellent."



From a wide choice of optional engines, Nello L. Teer Co, Durham, N. C, chose 100% International power for their hot-mix plant . . . a 190 hp UD-24 on the tower, another UD-24 at the dryer, and a 125 hp UD-18A on the fan. Output averages 1,000 tons per 10-hour day.

City of Danville (Va) replaced original engines in their two ½ yd shovels with 75 hp UD-350's. "These International engines have sure cut our operating costs," reports Works Director H. F. Bowling. Each shovel now uses only 17 gallons of fuel to produce 95 five-yard truck loads per day.



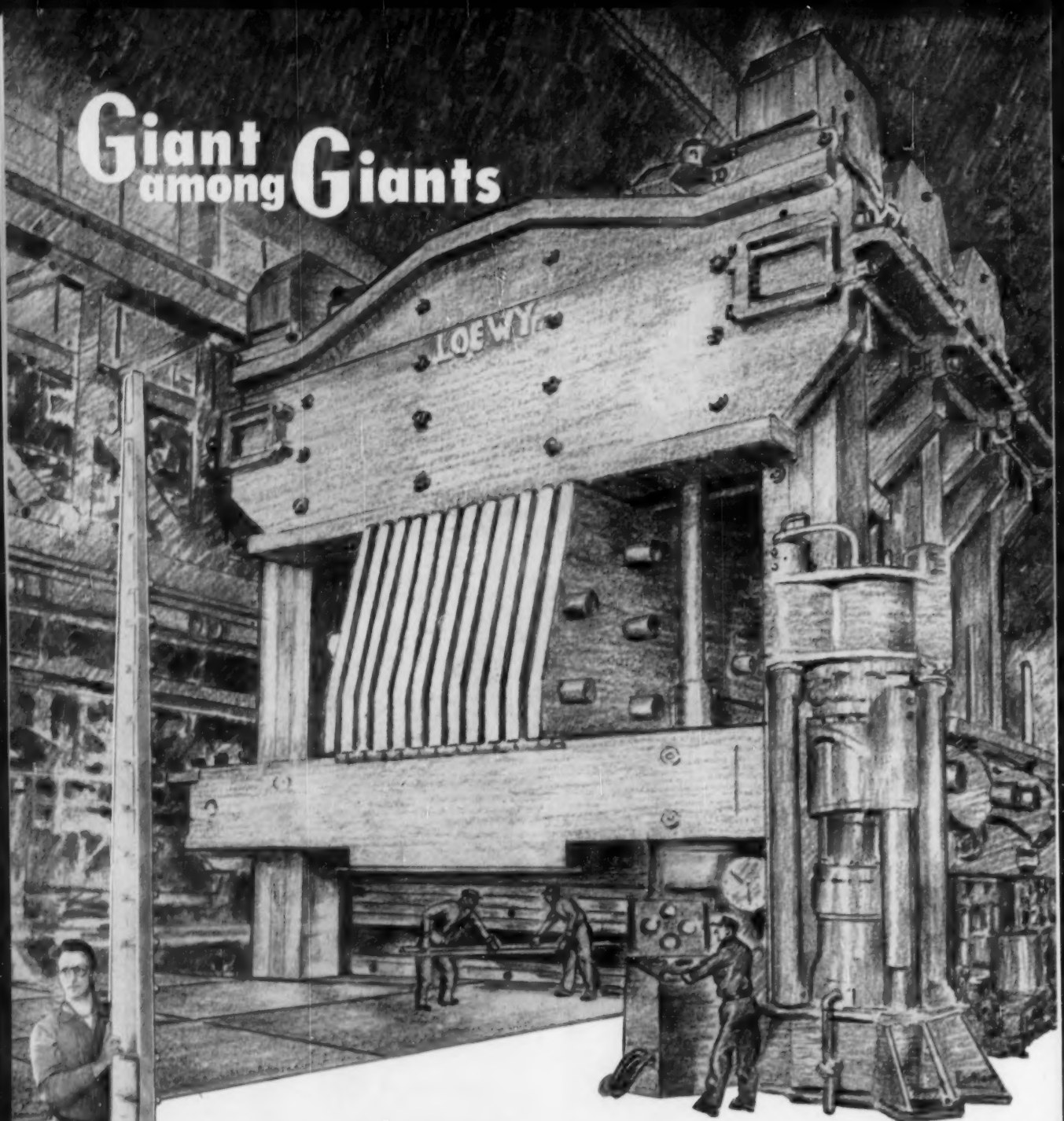
For low maintenance crusher power, you can't beat International. This UD-24 has worked 12,000 hours in 7 seasons for Sheboygan County, Wis . . . has produced 700 tons per day . . . yet has needed only one overhaul. "Most dependable engine we know of," says the pit superintendent.

Our design engineers are well qualified to help you select the correct engine sizes and styles for your needs. Write us for details on torque curves and power characteristics.

International Harvester Company, Chicago 1, Illinois

INTERNATIONAL INDUSTRIAL POWER

Giant among Giants



Today there are giants at Wyman-Gordon! Among them the largest single machine ever constructed – a 50,000 ton closed-die forging press – is now producing larger forgings with thinner sections and closer tolerances than ever before. Companion giants include 35,000 ton, 18,000 ton, 7,000 ton presses representing the greatest forging press capacity assembled under one roof in the world – 110,000 tons ready to meet the demands of industry today and tomorrow. Wyman-Gordon, greatest name in forging – is "Keeping Ahead of Progress".

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Established 1883

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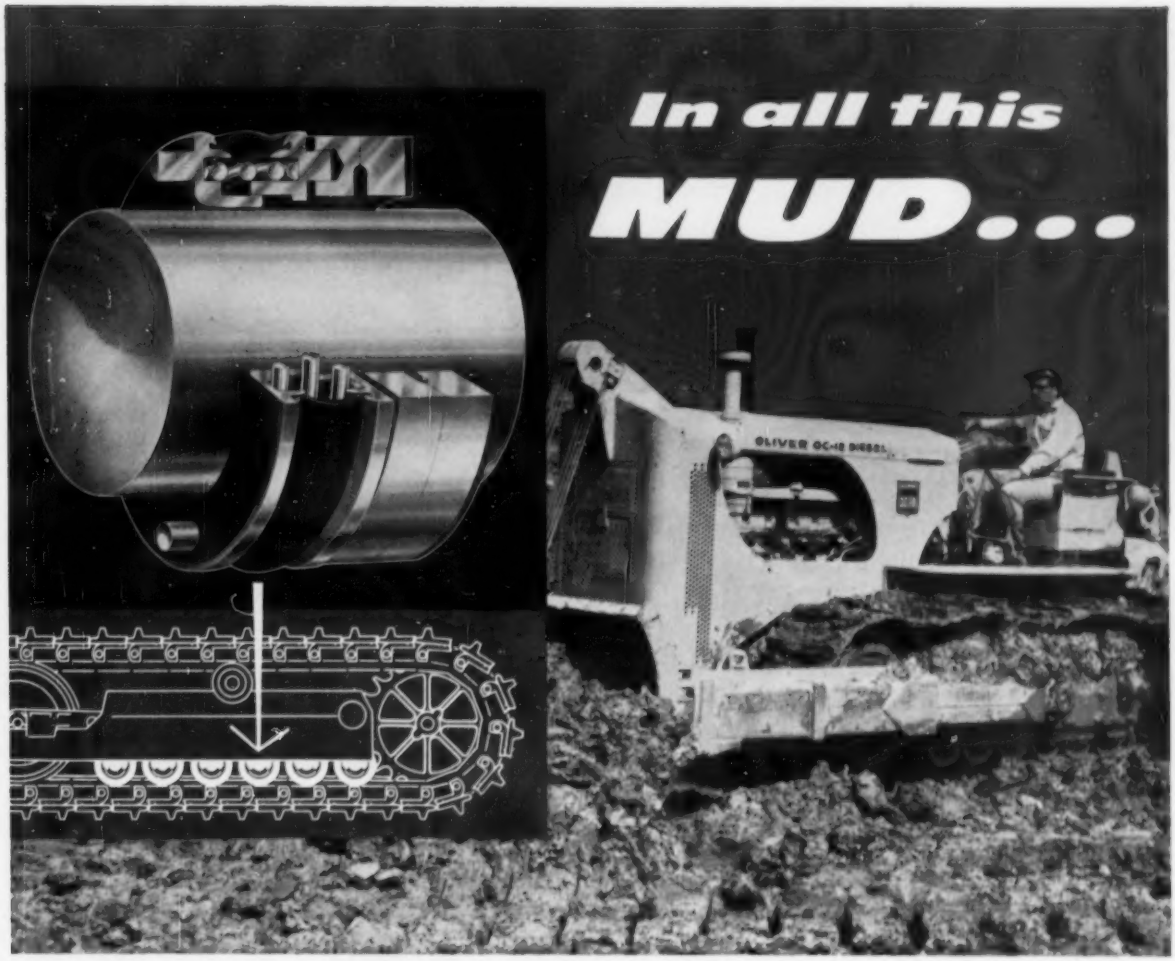

TRACK WHEEL BEARINGS ARE COMPLETELY PROTECTED

Whether it's tropical muck or crystal sharp Alcan dust, nothing sneaks past the C/R End Face Seals guarding the track wheels of this giant Oliver OC-18 Crawler. And here's why: The mating rings in this steel-on-steel C/R Seal are lapped flat within .000034 inch! They form a leakproof seal so dependable that even under the worst field conditions the oil and the bearings stay clean and the oil level does not require the usual frequent checking. Seal performance like this cuts downtime for lube checks . . . saves big money on round-the-clock operations. You can have equally dependable performance . . . and savings . . . with C/R Oil Seals.

C/R engineers will cooperate with you on special designs, or help select the right stock seal for a wide range of applications. Write for detailed information.

More automobiles, farm and industrial tractors rely on C/R Oil Seals than on any similar sealing device.

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Offices in 55 principal cities. See your telephone book.

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Export Sales: Geon International Corp., Great Neck, New York

OIL SEAL C/R DIVISION
CHICAGO RAWHIDE

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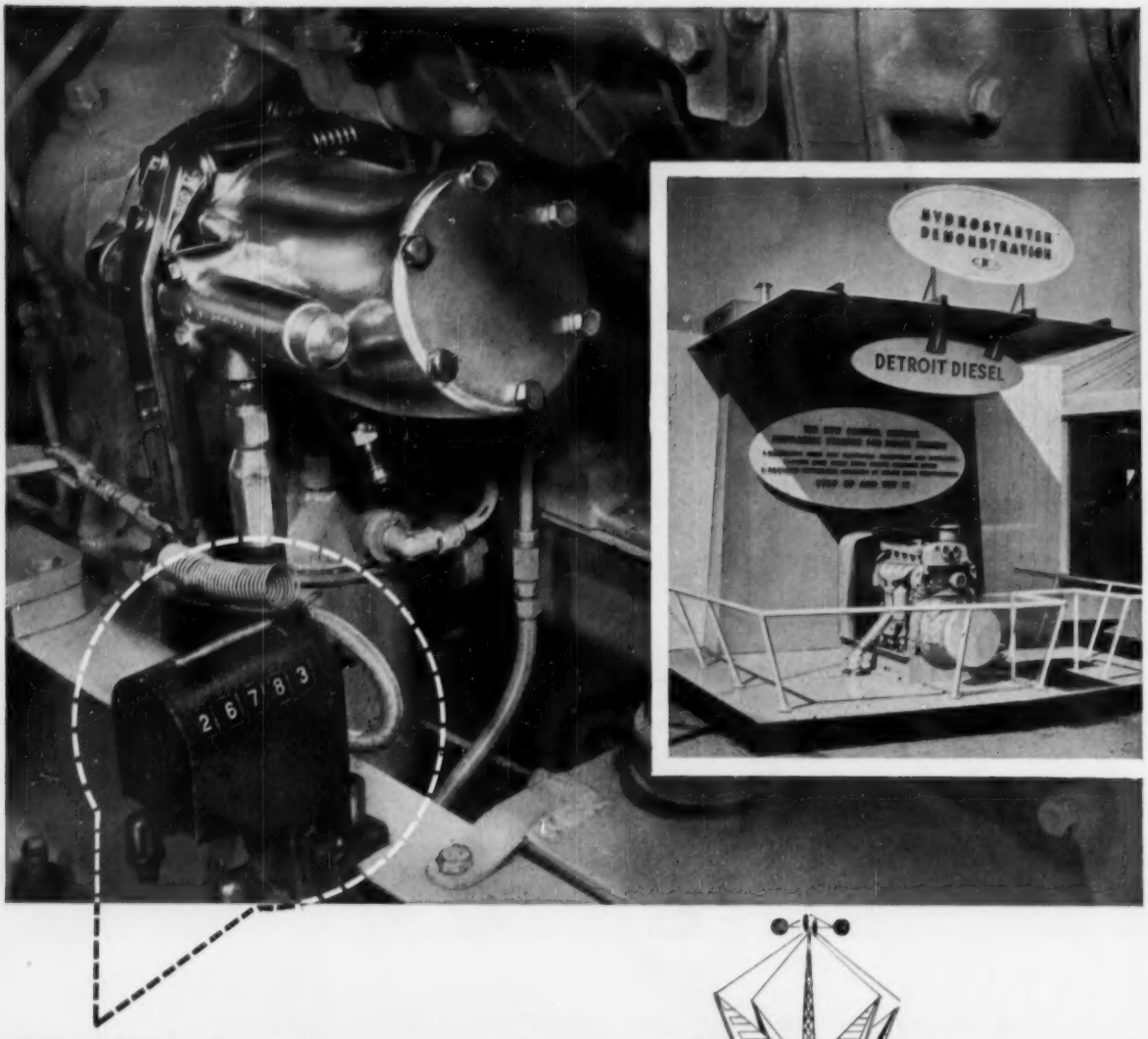


26,783 Starts in 26 days at GM Powerama!

(and the total is still growing at the GM Motoramas!)

HERE'S PROOF of the rugged dependability of a General Motors Hydrostarter—the new, low-cost hydraulic starting system now available on all GM Detroit Diesel engines:

> On public demonstration at the GM Powerama, a Hydrostarter started a GM Detroit Diesel 26,783 times in 26 days—an average of more than 1,000 starts per 12-hour day—more than 1 start every minute.

A Hydrostarter gets a GM Detroit Diesel up to starting speeds 80% faster than regular starting systems—costs less to maintain than electric starters—sells for a far lower price than any other non-electric Diesel starter.

And it gives you fast, sure starts—even at sub-zero temperatures, or when your equipment has been standing idle for long periods of time.

Call your GM Diesel Distributor for full details on the GM Hydrostarter—or write direct for more information.

DETROIT DIESEL

Engine Division of General Motors

Single Engines . . . 30 to 300 H.P.
Multiple Units . . . Up to 893 H.P.

America's Largest Builder of Diesel Engines

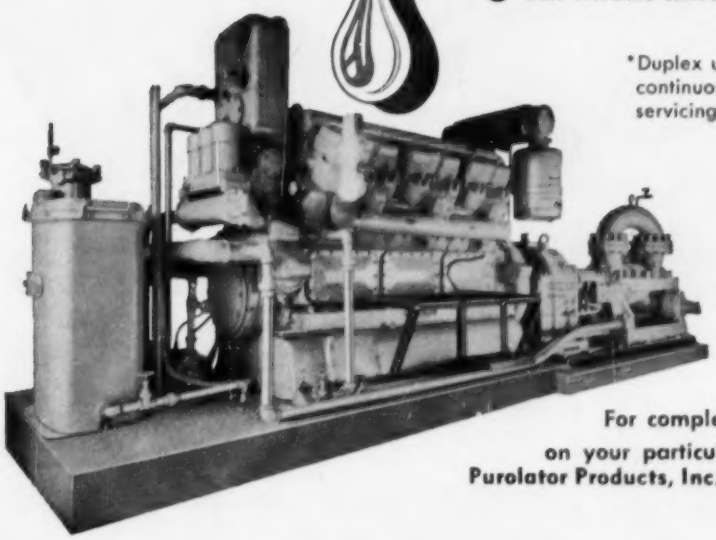
For positive filter protection . . .

CHECK THESE 5 POINTS WITH PUROLATOR

"FIRST in the field of filtering"

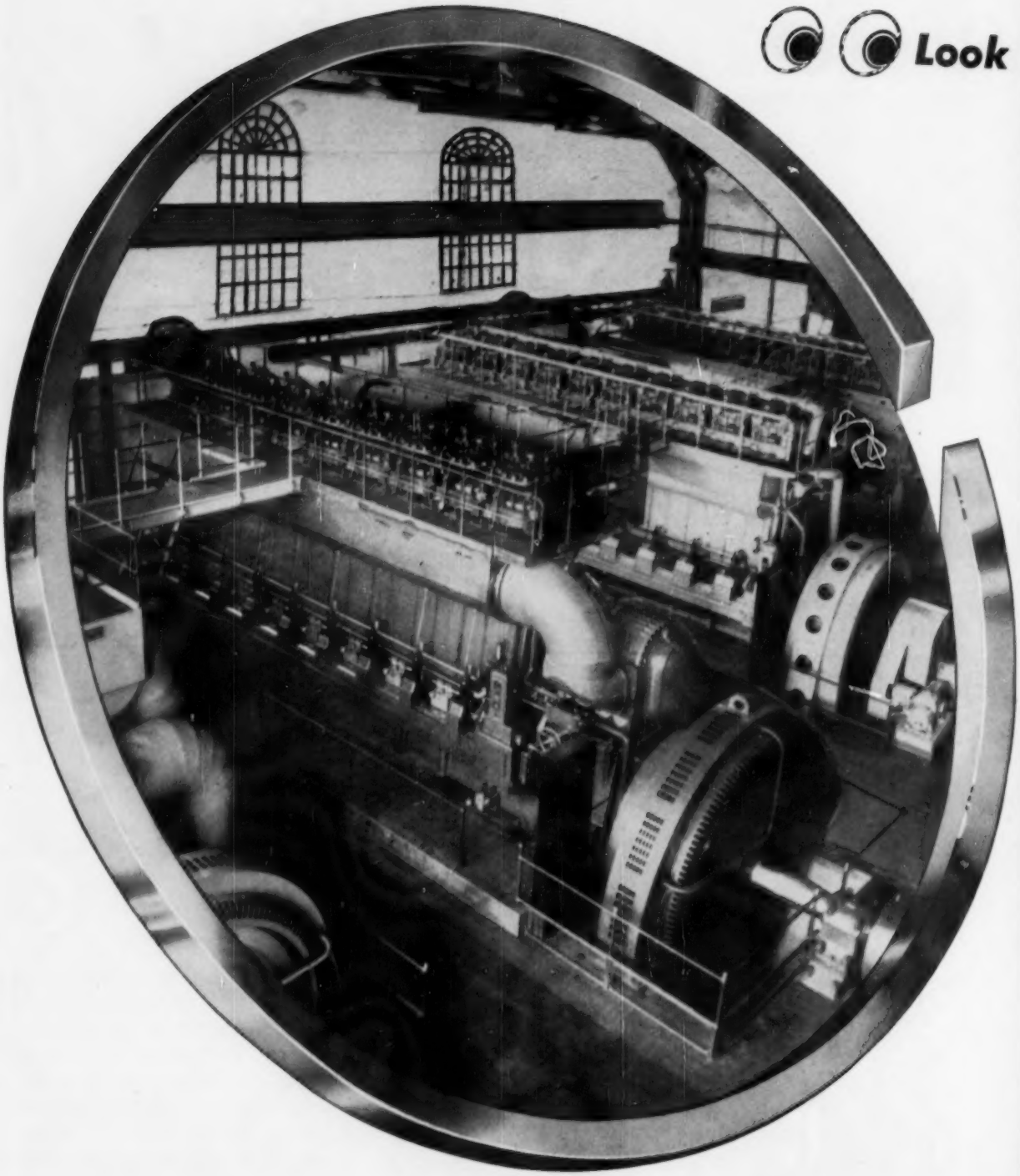
- Full flow lubricant filtration
- Micronic filtration of fuel to the injector pump
- Individual filter protection for each nozzle
- Metal edge filter to protect fuel transfer pump *
- Air intake filtration

*Duplex units available for continuous operation while servicing filter elements.



For complete technical filter data on your particular diesel application, write to Purolator Products, Inc., Dept. DL1-311, Rahway, New Jersey.

Look



to COOK for Better Rings!

COOK Piston Rings Help Rockville Centre Diesel Average Less Than .001" Cylinder Wear Per 1000 Hours!

SINCE 1928, the Rockville Centre (N. Y.) municipal power plant has consistently racked up some of America's most impressive performance records.

The performance of its No. 8 unit — a Nordberg Type TS-21-9 — is typical. After 25,037 operating hours *(2.86 years!)* inspection of the cylinders revealed the following:

1. Liners were in excellent condition — clean and free of lacquer and carbon.
2. While several rings were renewed in Grooves 1 and 2, no rings were renewed in Grooves 3, 4, 5 and 6, and these can run for an additional 10,000 hours.
3. *Cylinders averaged less than .001" maximum wear per 1000 hours of operation!*

This record is a tribute to Rockville Centre's management and operating personnel, and C. Lee Cook piston rings.

If you're looking for a seal with the savings built in, mail the coupon for product information and the name of your nearest C. Lee Cook representative.

TENSION THAT NEVER WEARS OUT!

Cook Piston Rings are tensioned on a Cook-designed machine which accurately controls the amount and distribution of tension. This exclusive process gently "squeezes" tension into the rings, with a series of small indentations—avoids harmful disarrangement of the rings' molecular structure. *The result is constant, uniform tension that never wears out!*

C. LEE COOK COMPANY

Sealing Pressures Since 1888

C. Lee Cook Company
988 South 8th Street
Louisville 3, Kentucky

Gentlemen: Please send me complete information on Cook Piston Rings and name of nearest representative.

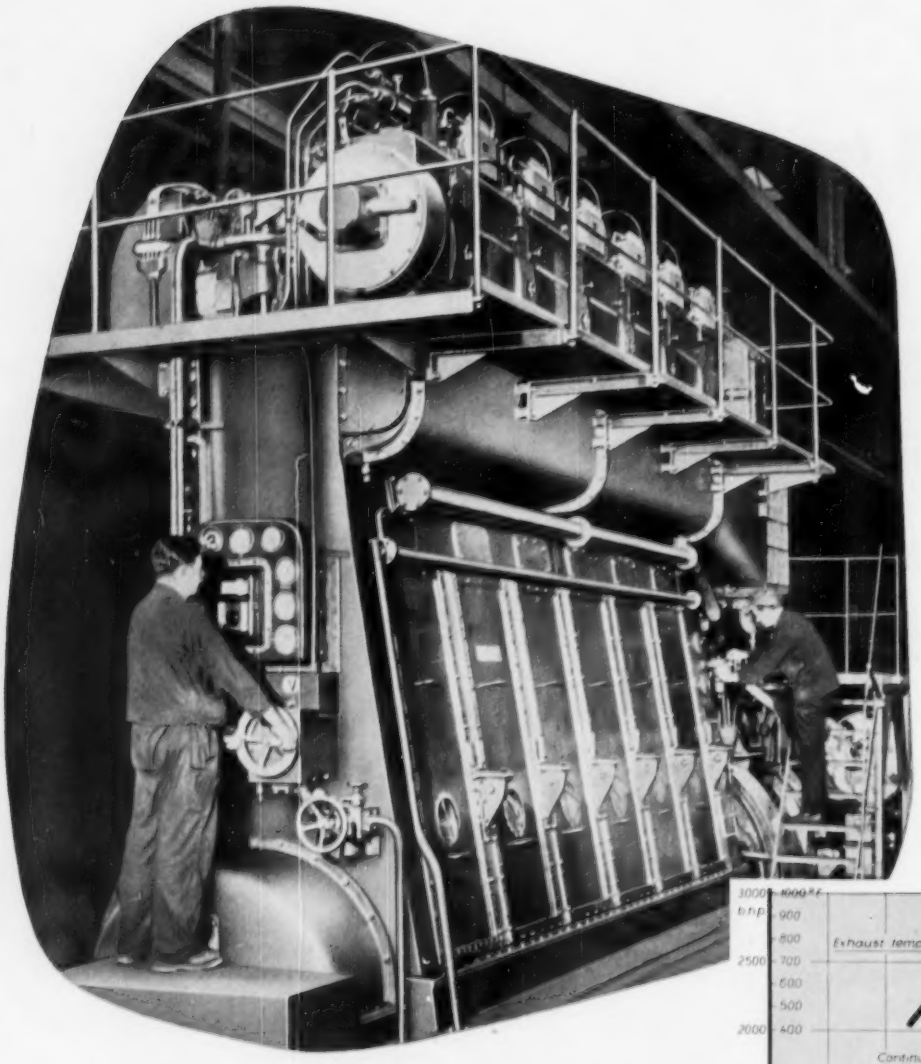
Firm_____

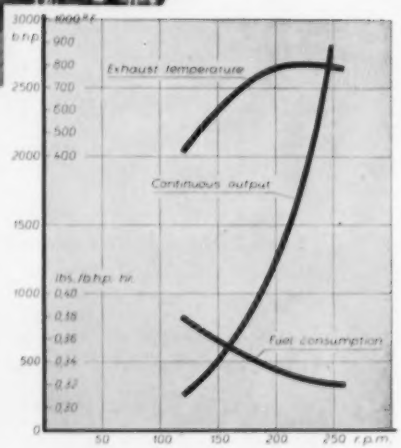
Street_____

City_____ State_____

Attention_____

Type of Units_____





High Supercharging and Operation on Heavy Fuel Oil

The engine type KV with high supercharging is designed for highest economy. It has an extraordinarily low fuel consumption. The crosshead design renders this engine particularly suitable for the combustion of heavy fuel oils. After long workshop tests this engine has proven its entire reliability in practical service as main propulsion engine for ships.

M·A·N

MARINE DIESEL ENGINE

MASCHINENFABRIK AUGSBURG-NÜRNBERG AG. · WERK AUGSBURG

Represented in all countries

MORE PULL WITH LESS FUEL!

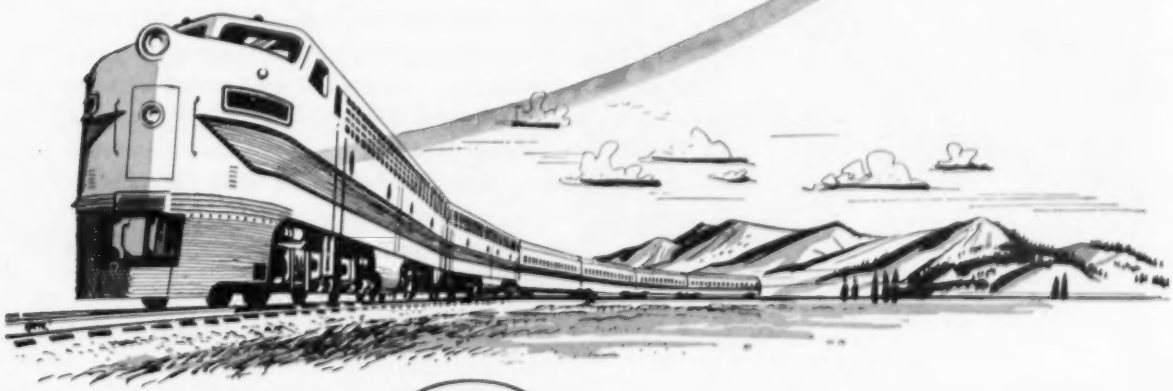
AiResearch Turbochargers provide rapid response to acceleration demands... end objectionable smoking!

Consider what the application of AiResearch Turbochargers to diesel locomotives will accomplish: A team of these small power packages will provide a greater increase in power at smaller cost in space and weight than any comparable turbocharger or supercharger installation.

In addition, specific fuel consumption on a horsepower per hour basis will be far less. Sea level performance will be restored within operating limits at altitude, response to acceleration demands will be rapid and excessive smoking under operating power eliminated. Also, the noise level will be greatly reduced.

Application in other fields will be equally effective, as has already been demonstrated in the remarkable results achieved by the installation of AiResearch Turbochargers on Caterpillar diesel machinery.

AiResearch is the largest producer of small turbomachinery in the United States, with twenty-five *million* hours of experience. This unmatched experience explains why AiResearch Turbochargers lead in power, economy and dependability.
Your inquiries are invited.



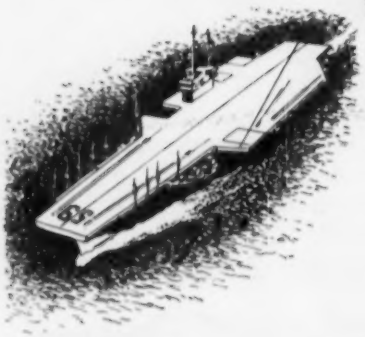
THE GARRETT CORPORATION

AiResearch Industrial Division

9225 Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

Aboard the U. S. S. FORRESTAL . . .
Erie Forge Propeller Shafts



NO better example of the capabilities of Erie Forge & Steel Corporation could be offered than the one above. For many years our skilled craftsmen have made steel ingots from raw materials, transformed them into finished products to meet the demands of power transmission in wide variety . . . finished cranks, rotor shafts, drive shafts, connecting rods, a wide diversity of steel castings for industry . . . completed within the confines of one plant with one responsibility and under one control.

Consult with us on your forged steel and steel casting projects —each of us will profit.

ERIE FORGE & STEEL CORPORATION · ERIE, PENNSYLVANIA

MEMBER AMERICAN IRON AND STEEL INSTITUTE

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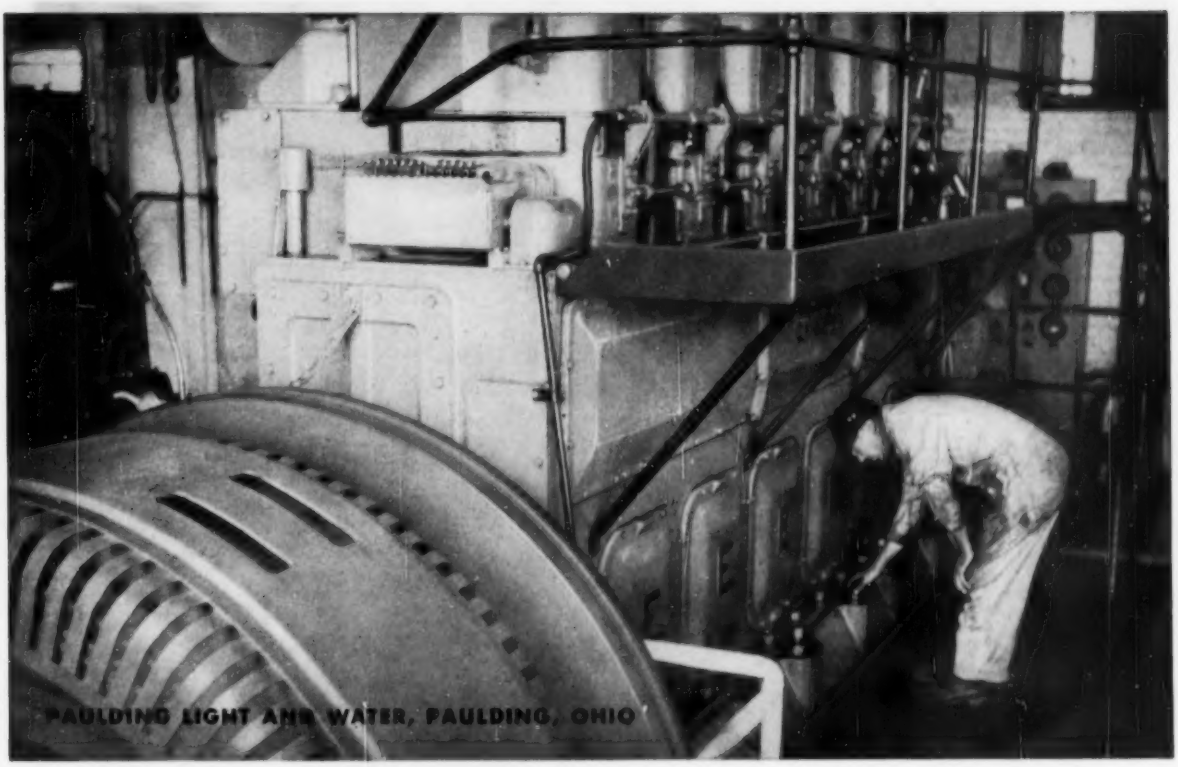


"16,587,402 H. P. hours without oil change using Cities Service C-300 Lube Oil!"

1000 KW Enterprise uses only one gallon of oil in 23,205 BHP hours, has no oil reclaimer.

The main part of the power output of Paulding Light and Water Company is developed by its dual-fuel, 1000 KW Enterprise Unit.

Mediocre performance can't be tolerated at Paulding . . . the power load is running twice that of seven years ago!

"Fortunately," says Superintendent James J. Leslie, "performance is tops—and much of the credit is due Cities Service C-300 Lube Oil. We really pile up hours with C-300 . . . and still get excellent engine life. I've never had the head off the Enterprise since it was first installed in 1953, yet compression, fire pressure, and fuel economy are still very good.

"We've actually logged up to 16,587,402 H.P. hours without an oil change. We use only 1.5 gallons of C-300 Lube Oil per day, which amounts to 23,205 brake-horsepower hours per gallon . . . and that's with no oil reclaimer! I'd recommend Cities Service to any power plant."

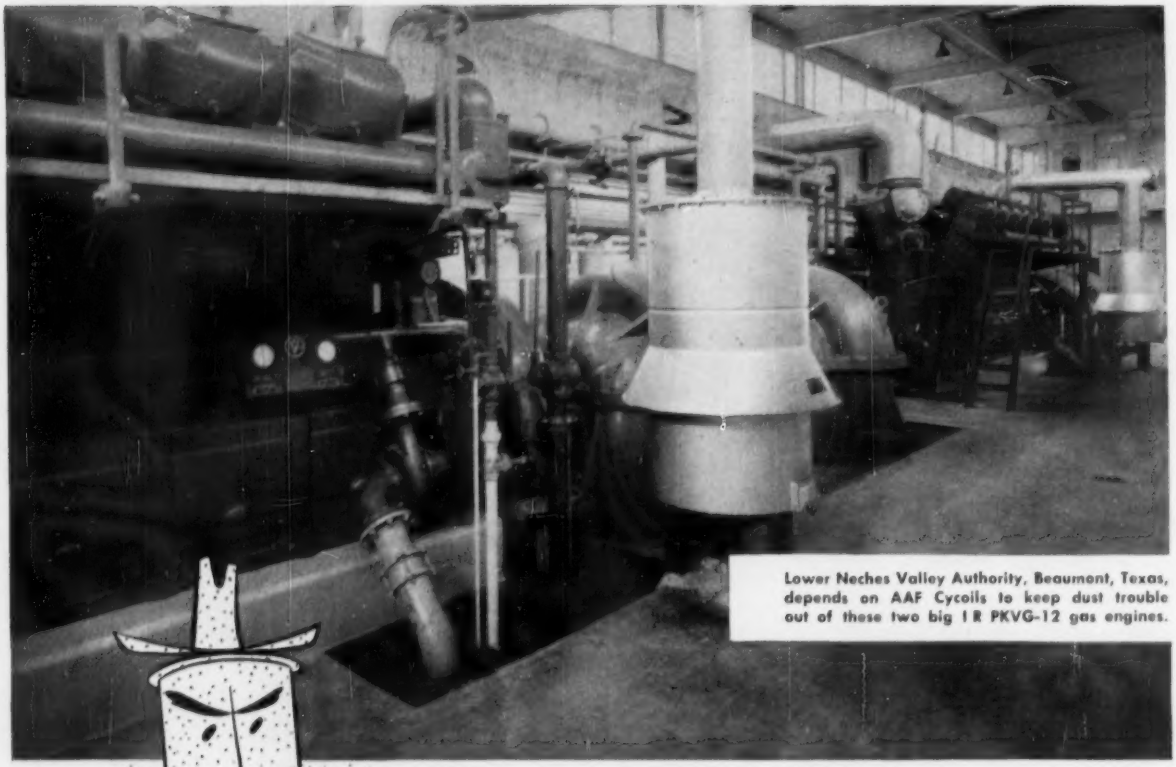
If you're interested in Mr. Leslie's recommendation, talk with your Cities Service Lubrication Engineer. He can tell you of other outstanding case histories. Or write: Cities Service Oil Co., Sixty Wall Tower, New York 5, N. Y.

Electric Service Goes Hand in Hand with Cities Service at Paulding Light & Water. Paulding's Enterprise dual-fuel power unit gets 23,205 BHP hrs. for every gallon of Cities Service C-300 Oil that's consumed. Oil changes are made about every 11,000 hrs.

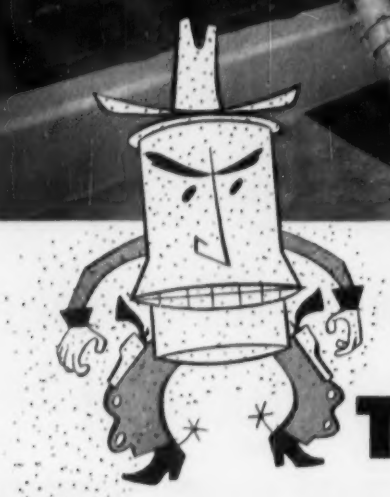
"We're Really Able to Pile Up Hours and still get good engine life using Cities Service C-300 Lube Oil," says Supt. Leslie. "I've never had the head off the Enterprise since it was installed in 1953. Compression, fire pressure, and fuel economy are excellent."

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



Lower Neches Valley Authority, Beaumont, Texas, depends on AAF Cycoils to keep dust trouble out of these two big I R PKVG-12 gas engines.



CYCOILS Corral Tough Texas Dust

THESE two gas engines each drive two pumps in tandem, with capacity of 110,000 gpm per unit, for the Lower Neches Valley Authority, Beaumont, Texas. It's a big job. There's no time for down-time.

That's why you see those AAF Cycoil heavy-duty oil bath air cleaners on the job. They provide 4-way cleaning—impingement, scrubbing, cyclonic action and filtering. Over 90% of the fine dust content in the air is trapped in oil and removed by centrifugal action before most of it even reaches the filter pads! Additional action of filtering pads, what's more, plus positive oil circulation for self-cleaning action, provides air that's virtually 100% *dust-free.*

Only Cycoil gives engines and compressors this kind of protection. Write for Bulletin No. 130 . . . the nuts-and-bolts, facts-and-figures story on Cycoil Oil Bath Air Filter!

Type CMS Multi-Duty Filters

Type G Pipeline Air Filters

American Air Filter
COMPANY, INC.
445 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

BETTER AIR IS OUR BUSINESS

Type OCH Intake Air Filters

Cycoil Oil Bath Air Filters

KAHLENBERG CHOSE *NAPIER*

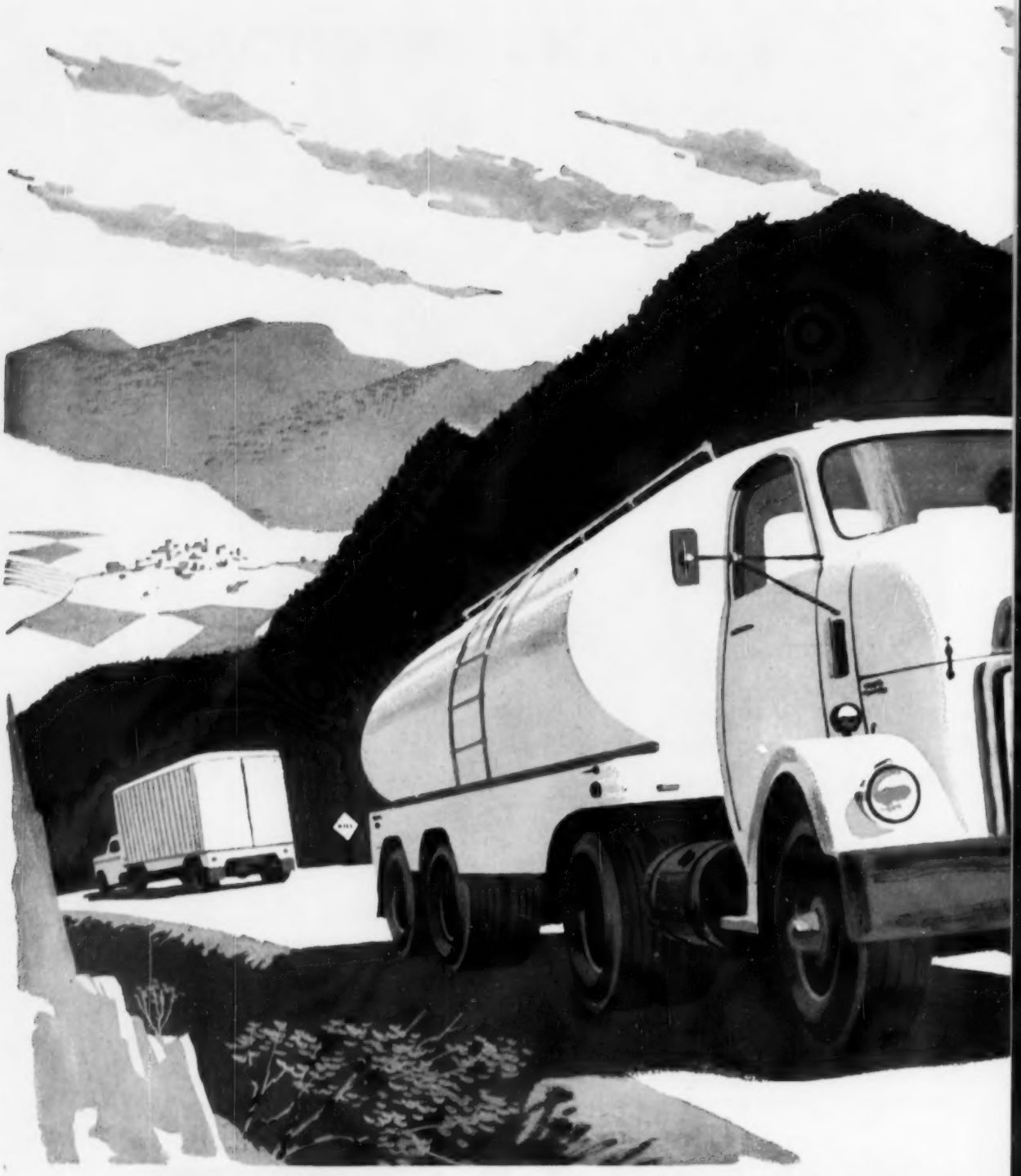
Napier turbo-blowers fitted to 2-stroke Marine diesel engines are currently increasing power output by at least 30% and even more on industrial applications. Or—if you prefer it this way—with a Napier turbo-blower you can get the same amount of power from a much smaller engine. Specific fuel consumption is no higher and can often be reduced. They are available in seven sizes to suit engines of approximately 140 h.p. to 4,000 h.p. Multiple installations are available for engines of higher powers.

KAHLENBERG BROS. CO., have installed *NAPIER* Turbo-Blowers on their latest Model E6 Two-stroke, uniflow scavenged Marine Engine.

NAPIER Turbo-blowers

IN USE IN 56 DIFFERENT COUNTRIES

D. Napier & Son Limited. 211 The Vale, London, W. 3. | Representative: L. O. Brooks, Suite 909, Dupont Circle Building, 1346 Connecticut Avenue, Washington 6, D. C.



GM
GENERAL MOTORS

GENERAL MOTORS LEADS THE WAY

You can minimize downtime

in over-the-road service with Delco-Remy heavy-duty electrical equipment

Every unit in Delco-Remy's famous heavy-duty line is designed and built to take the day-in-day-out pounding of over-the-road operation . . . to give many thousands of miles of dependable service.

For example, Delco-Remy 5½-inch diameter heavy-duty D.C. generators include such long-life features as extra-large commutator and brushes (brush life of 100,000 miles is common), ball bearings, wick-type lubrication with oilers, and forced ventilation. These generators are available, with matching regulators, in a wide variety of voltage ratings and output capacities.

Other specially-designed Delco-Remy heavy-duty units include cranking motors, coils and other ignition components, and Delco long-life Extra-Duty batteries with rubber separators and Delcoloy grids.

For more dependable service with minimum downtime, specify Delco-Remy heavy-duty electrical equipment when you order new vehicles or modernize your present ones. Complete details on Delco-Remy heavy-duty electrical equipment are available through your nearest General Motors car or truck dealer, or the United Motors System.

DELCO REMY • DIVISION OF GENERAL MOTORS • ANDERSON, INDIANA

STARTING WITH **Delco-Remy** ELECTRICAL SYSTEMS

EDWIN J. THOMAS

Portrait by Fabian Bachrach

"...added over 20,000 employees to The Payroll Savings Plan."

"The Savings Bond Program—like any other program in a corporation—will succeed *only* if it has the complete support of top management. Recently the Goodyear Tire & Rubber Company added over 20,000 employees to the Payroll Savings Plan, attaining an overall participation of over 71%. While the drive itself was successful I feel the job is only half done. Now we are installing a program to maintain this high peak of participation. Such a program will constantly keep the merits of the program before each employee, encouraging him to provide his own security through this effortless plan of saving."

EDWIN J. THOMAS, ***President***
The Goodyear Tire & Rubber Company, Inc.

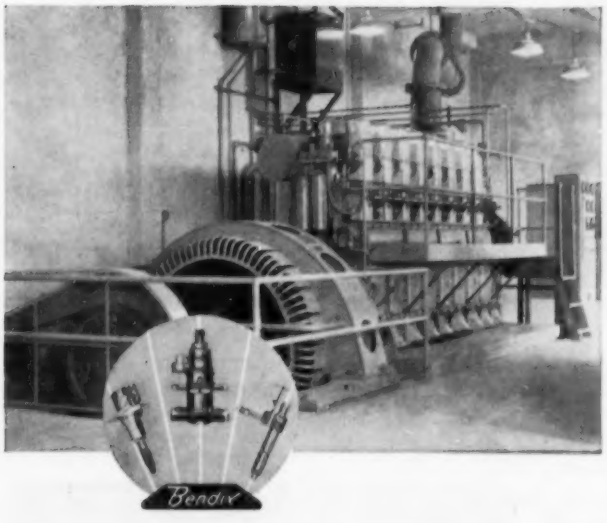
What is the percentage of employee participation in *your* Payroll Savings Plan? If it is less than 50%, get in touch with Savings Bond Division, U.S. Treasury Department, Washington, D. C. Your State Sales Director will be glad to help you increase your participation to 60% or higher. A phone call, telegram or letter to Savings Bond Division, U.S. Treasury Department will bring a prompt response.

The United States Government does not pay for this advertising. The Treasury Department thanks, for their patriotic donation, the Advertising Council and

"DIESEL POWER"

ENTERPRISE 1000 KW DIESEL GENERATOR WITH

Bendix FUEL INJECTION EQUIPMENT!



Providing emergency power facilities for the vast, new San Francisco International Airport is no small task. Yet, the Enterprise Diesel Generator with Bendix* Fuel Injection Equipment, set for standby duty at this modern new airport, is prepared to quickly deliver ample emergency power.

As you can appreciate, specifications met by Enterprise engineers in making the installation were rigid.

First, within 15 seconds after any power failure, the Enterprise engine starts up and cuts in automatically on the landing light and runway light circuit. Then, in less than 15 minutes, full load is attained to power storm sewer, pumps, necessary emergency equipment, terminal, concourse and tower lighting. It was further required that the Bendix equipped power plant provide continuous full-load operation for weeks or even months without "shutdown". Actually, this mighty standby generator in prior tests not only met, but actually surpassed these rugged requirements.

Here, once again, is proof that when operating conditions demand unfailing dependability, Bendix Fuel Injection Equipment is the choice of leading diesel engine manufacturers.

*REG. U.S. PAT. OFF.

SCINTILLA DIVISION, BENDIX AVIATION CORPORATION
SIDNEY, NEW YORK

Export Sales and Service:
Bendix International Division, 205 East 42nd St., New York 17, N. Y.

SCINTILLA DIVISION

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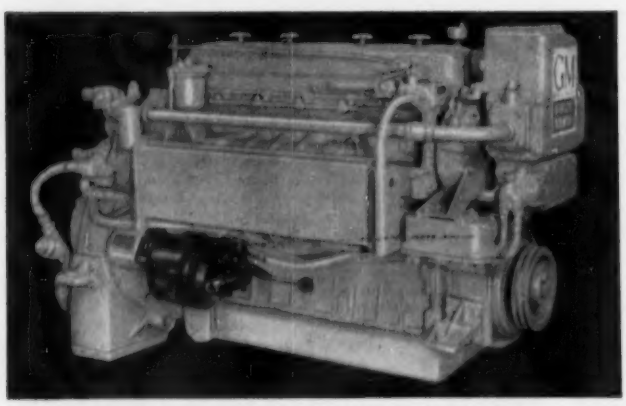
Bendix AE

HAND-CRANKED INERTIA STARTER



Performance proved on thousands of diesel- and ignition-fired marine and industrial engine installations.

To low installation cost, add rugged, simple design and dependable operation. Then you have the explanation of why the Bendix AE hand-cranked inertia starter is in such big demand by men in the oil, marine, construction, agriculture and mining fields. Particularly in remote areas and under difficult operating and climatic conditions, this starter fills a very real need. For full details write BENDIX INTERNATIONAL, DIVISION OF BENDIX AVIATION CORPORATION, 205 East 42nd Street, New York 17, N.Y. Cable: "Bendixint", N.Y.

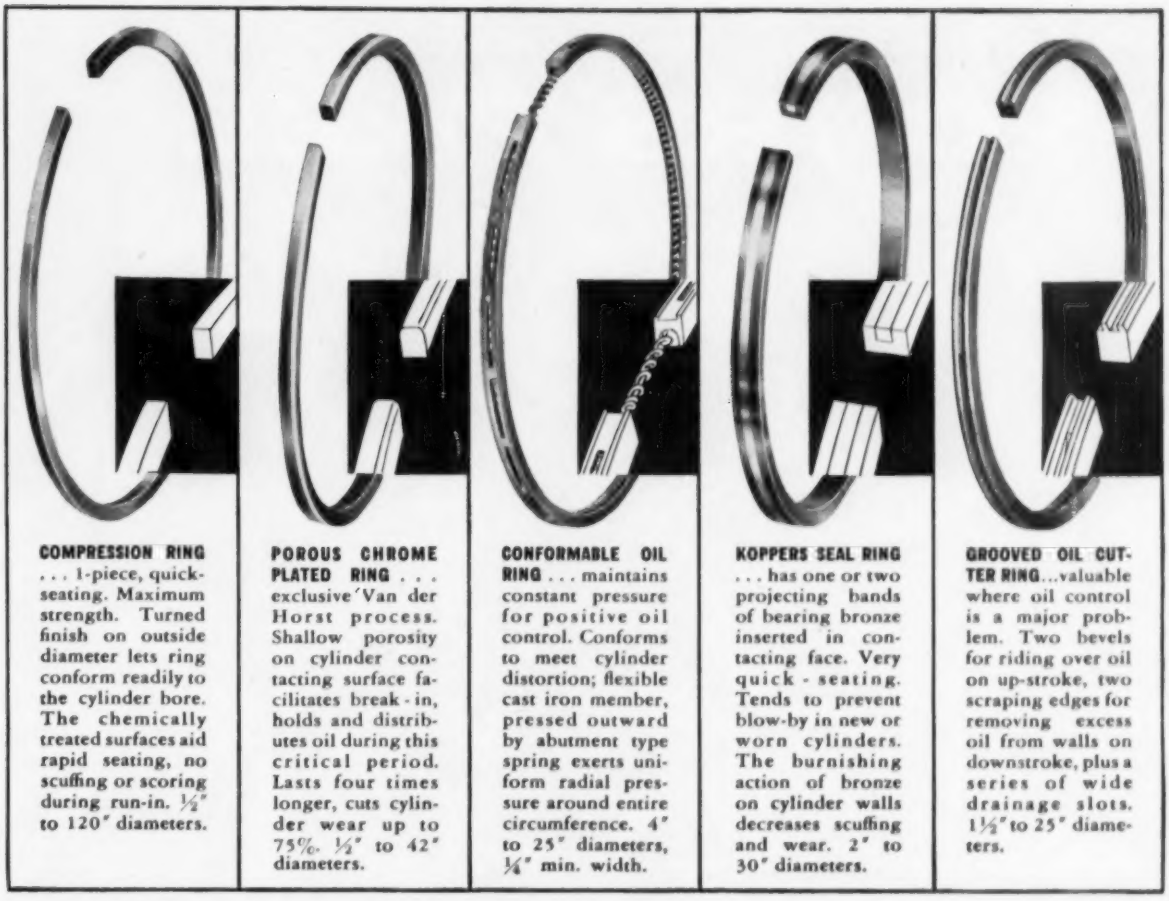
COSTS LESS TO INSTALL

HERE'S WHY:

- **Requires NO CABLES, NO PUMPS, NO PLUMBING**
- **More easily mounted and in more positions**
- **Can be installed in ten minutes without the use of any special tools**
- **Completely self contained . . . no "extras" to buy**

Bendix INTERNATIONAL Product

Bendix AVIATION CORPORATION



COMPRESSION RING . . . 1-piece, quick-seating. Maximum strength. Turned finish on outside diameter lets ring conform readily to the cylinder bore. The chemically treated surfaces aid rapid seating, no scuffing or scoring during run-in. ½″ to 120″ diameters.

POROUS CHROME PLATED RING . . . exclusive Van der Horst process. Shallow porosity on cylinder contacting surface facilitates break-in, holds and distributes oil during this critical period. Lasts four times longer, cuts cylinder wear up to 75%. ½″ to 42″ diameters.

CONFORMABLE OIL RING . . . maintains constant pressure for positive oil control. Conforms to meet cylinder distortion; flexible cast iron member, pressed outward by abutment type spring exerts uniform radial pressure around entire circumference. 4″ to 25″ diameters, ¼″ min. width.

KOPPERS SEAL RING . . . has one or two projecting bands of bearing bronze inserted in contacting face. Very quick-seating. Tends to prevent blow-by in new or worn cylinders. The burnishing action of bronze on cylinder walls decreases scuffing and wear. 2″ to 30″ diameters.

GROOVED OIL CUTTER RING...valuable where oil control is a major problem. Two bevels for riding over oil on up-stroke, two scraping edges for removing excess oil from walls on downstroke, plus a series of wide drainage slots. 1½″ to 25″ diameters.

Five Koppers Rings . . . worth their weight in gold!

What will American Hammered Industrial Piston Rings *do for you?* They'll save you money on fuel, on lubricating oil, on labor costs—by reducing down-time.

They'll maintain high compression, improve your operation, give you *much* longer service. They don't cost much . . . but they have over 35 years of manufacturing skill and accumulated experience behind them. They never let you down, they never fail in the jobs they're designed to do—and hundreds of satisfied users will tell you that, despite their low cost, Koppers rings *are* worth their weight in gold.

American Hammered Piston Rings are available in all types, all sizes—from ½″ to 10′ diameter—for every purpose. Koppers makes American Hammered Rings for all kinds of industrial equipment, can recommend without bias as to types. It costs nothing to consult Koppers—for illustrated Piston Ring booklet write to KOPPERS COMPANY, INC., *Piston Ring & Seal Dept.,* 1303 Hamburg Street, Baltimore 3, Md.

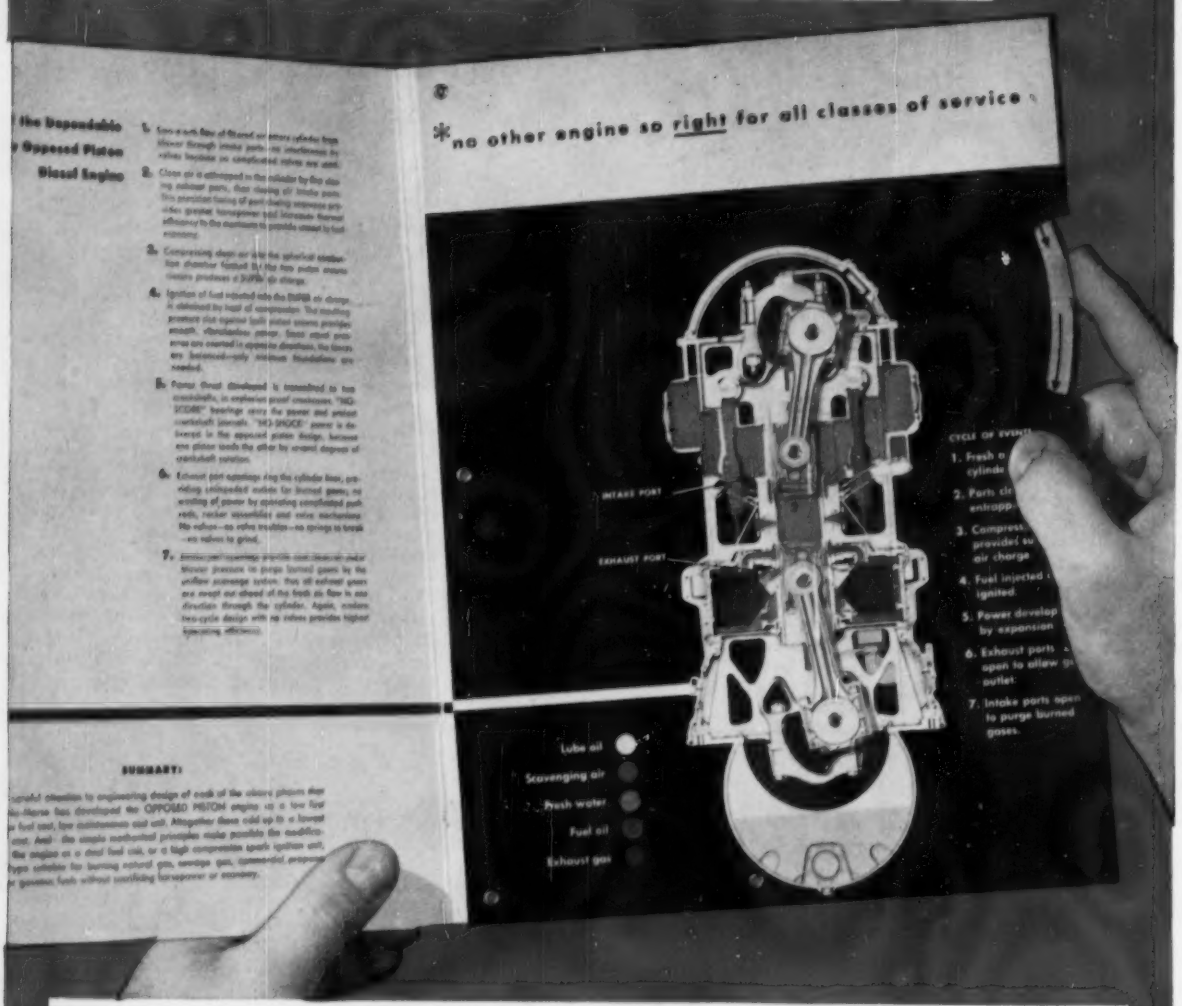
METAL PRODUCTS DIVISION • KOPPERS COMPANY, INC. • Baltimore 3, Maryland
This Koppers Division also supplies industry with Fast's Couplings, Industrial Gas Cleaning Apparatus, Aeromaster Fans, Gas Apparatus.
Engineered Products Sold with *Service*

KOPPERS®

AMERICAN HAMMERED
Industrial Piston Rings

"Working Model" of the Opposed-Piston Diesel

YOURS FREE



Here in Graphic Full Color

is a detailed working model of the Fairbanks-Morse Opposed-Piston Diesel Engine—and it's yours free for the asking.

With the 8-inch operating cutaway in front of you, you can follow the complete operating cycle of this outstandingly successful heavy-duty engine designed for continuous service. Moving the disc at the right operates the model showing exact position of pistons, and color codes condition in the cylinder, throughout the entire cycle of events.

You'll also see the simplicity of the O-P that has no valves, intricate valve trains, cylinder heads and gaskets—in fact, it has 40% fewer moving—wearing—parts than any comparable engine of equal horsepower.

If you are interested in dependable power with low operating and maintenance cost, send for your working model of the O-P diesel today! Simply attach this advertisement to your letterhead (or ask for O-P "Working Model") and send to Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Illinois.

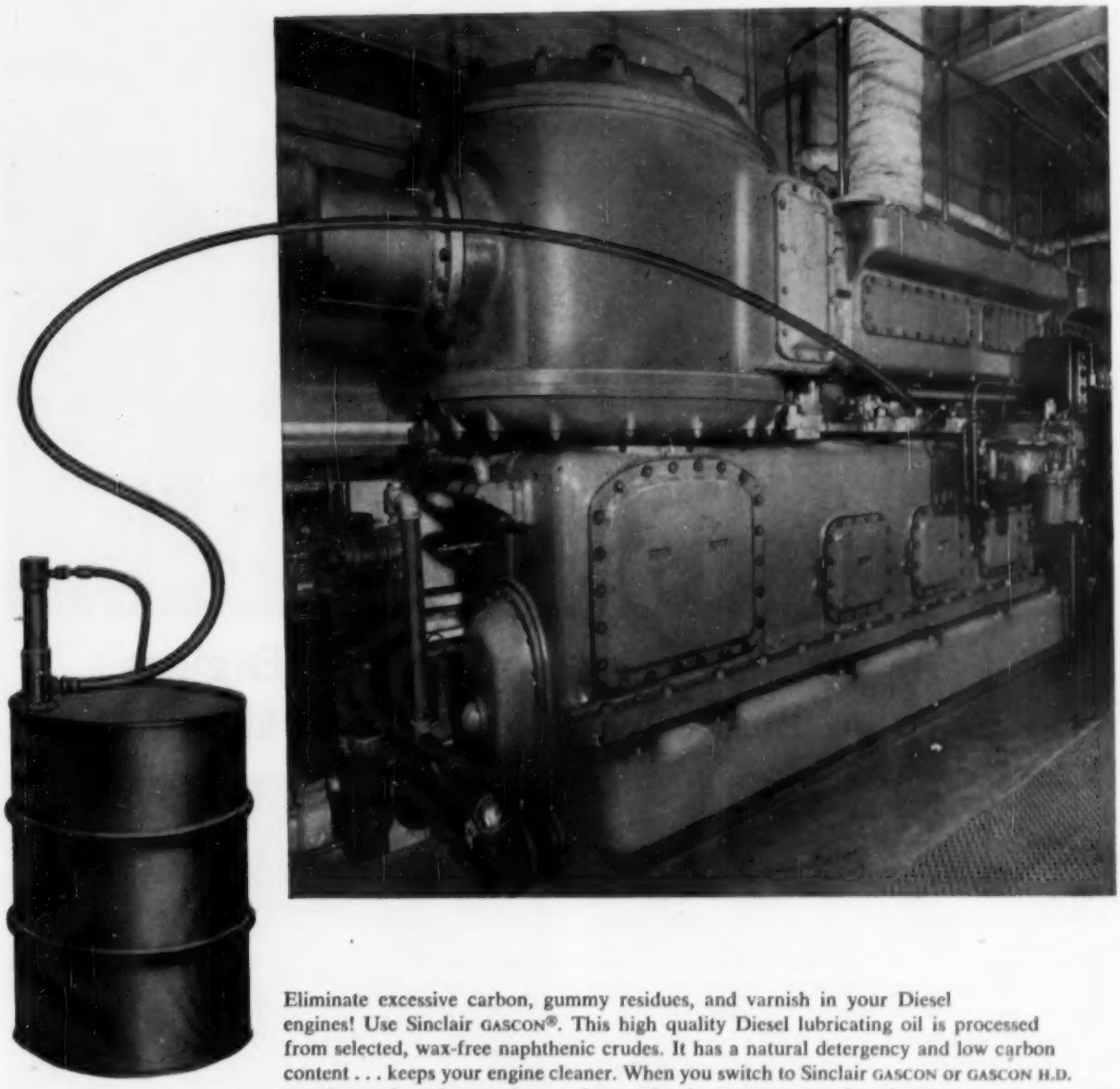
FAIRBANKS-MORSE

a name worth remembering when you want the BEST

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES
RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES
HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

See 8-Foot Working Model in F-M Booth 42 at A.S.M.E. exhibit in New Orleans, April 2-5

Check Carbon!



Eliminate excessive carbon, gummy residues, and varnish in your Diesel engines! Use Sinclair GASCON®. This high quality Diesel lubricating oil is processed from selected, wax-free naphthenic crudes. It has a natural detergency and low carbon content . . . keeps your engine cleaner. When you switch to Sinclair GASCON or GASCON H.D. you know that pistons, rings, valves and exhaust ports stay free from carbon, gums and varnish.

No matter what design of engine you're operating, you'll be 'way ahead with Sinclair's complete line of Diesel lubricants. Contact your local Sinclair Representative now for full details, or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y.

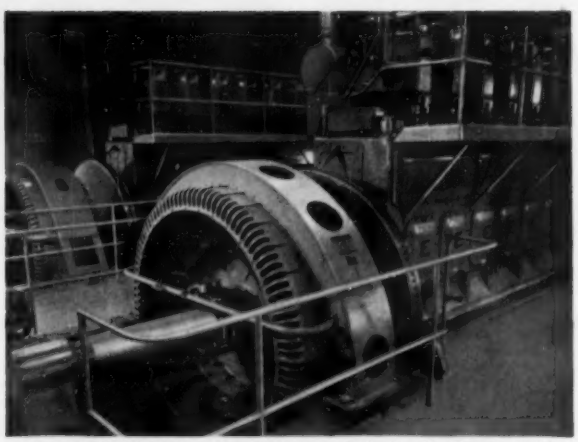
SINCLAIR GASCON OILS

• REPORT FROM JUNEAU, CAPITAL CITY OF ALASKA

Alaska City Relies on Enterprise Engines for Dependable, Versatile, Low-Cost Power

As with any community, the health and welfare of Juneau would be badly impaired if there were a prolonged interruption in electric power. That's why two modern Enterprise Diesel-electric generator sets have been installed to support the hydro-electric output in winter, and peak load periods during the summer months. With electrical demands nearly tripled since the first Enterprise Engine was installed in 1951, the second unit was ordered and placed in service early last year. This is a "twin" to the first DSQ-318 Enterprise, which had built a reputation for such excellent operation at low cost per KW of capacity.

Whether your community's need is for standby, partial load or complete utility service, Enterprise will serve you well. Get full information on Enterprise diesel, dual-fuel, tri-fuel and spark-ignited gas engine models from 73 to 7703 HP. Engines may be equipped to burn lower cost "heavy" or residual fuels if desired. Write today, or call your nearest Enterprise office for complete information.



Two 1700 HP Enterprise Engines at this Alaska Electric Light and Power Co. plant provide economical power for sharing the base electric load with hydro units, and for peaking. Each generator set delivers 1200 KW at only 360 RPM.

Over a million horsepower at work the world over!

ENTERPRISE
dependable **ENGINES**

ENTERPRISE ENGINE & MACHINERY CO.
Subsidiary of General Metals Corporation
18th and Florida Streets, San Francisco 10, California
Export Department, New York

Boston • Chicago • Denver • Des Moines • Fort Worth • Huntington • Jacksonville • Kansas City • Los Angeles
Minneapolis • New Orleans • New York • Pittsburgh • San Diego • Seattle • St. Louis • Tulsa • Washington, D.C.

Philosophies, not Catch-Words

Editors are schizophrenic. Schizophrenia—that's a medical term meaning (for business paper editors) that they have two heads. One attends to the particular industry served; the other is concerned with the editorial function. Believe it or not, this editorial bit is as exacting and complex as a job of design or maintaining a fleet of equipment. We even have a National Conference of Business Paper Editors. They hold work shops, clinics and hair-taking-down sessions, all aimed at improving editorial technology. We attended a meeting last week. It was a high-level thing with a lot of top talent. As you might expect when word-wranglers get together, certain key words and phrases kept popping up. Two in particular started the old wheels creaking. These were "motivation" and "creativity". Be assured that these are not just catch-words; each is practically a philosophy when taken in full context. Let's kick "motivation" around for a while. But first, our point. Both our heads agreed that such basic ideas belong to no one industry. What motivates a man to read or not read an article? Why does one advertisement impell him to buy while another doesn't? What makes him pick diesel power over other types? Or why does he select one make over another? For service, why go to this shop instead of that one? What makes one man want to work harder or do a better job than others? Why is this part bought and not that one? We've posed questions cutting through many fields; answers are harder. With changing times, incentives and needs require constant reevaluation. Glib recitation of obvious advantages are not enough. We have reports that an engine was picked because it idled better; or was shorter, fitting available space better; or because of superior service facilities. All industry pivots on the point of sale—whether product or service. How can you be sure of motivating sales unless you know the factors involved? It's a continuing study—a philosophy, if you will—that should be sparked in each organization from the top right on down to the grass-roots. ("Creativity" will have to wait until next month.)

B P E

Here's why we say
Sealed Power
Cyclan Compression Rings
will not break in service:
RING breakage in most cases is due to increased side clearance between ring and ring groove, and the inability of ordinary ring iron to deflect without damage when such clearance occurs.
Cyclan's superior wearing quality prevents excessive side wear. This fact has been proven by extensive field and laboratory testing comparing Cyclan with steel and standard cast iron. Test results showed average side wear figures for Cyclan to be up to 70% less than standard cast iron and up to 84% less than steel.
Cyclan's high modulus and impact strength allows ring to deflect without damage after excessive side clearance occurs. This was established by simulating actual operating conditions by machining a set of pistons with excessive side clearance and another set having the bottom of the top groove machined at an angle to twist the rings. In both cases the Cyclan ring survived far longer than the cast iron rings.
SEALED POWER CORPORATION • MUSKEGON, MICHIGAN
DETROIT OFFICE • 7-936 GENERAL MOTORS BUILDING • PHONE TRINITY 1-3440
Sealed Power Piston Rings
Leading Manufacturer of Automotive and Industrial Piston Rings since 1911
Largest Producer of Sealing Rings for Automatic Transmissions and Power Steering Units

highlights

Rail-mounted EMD generator sets are coming off the line now at the rate of one a week. And popularity of the mobile 1000-kw units is strongly evidenced by the daily increase in order slips.

Natural gas underground storage facilities have cost to date, more than $343 million. The next three years will see an additional $65 million going into this program.

Venn-Severin engines will reappear as soon as the Venn-Severin Engine Works, Hawthorne, Calif., get into production. Plans call for 2- and 3-cyl HCL's and a redesigned vee-type HCV in 4- and 6-cyl models. Power on the latter has been upped to 50-hp per cylinder at 1000 rpm.

New Haven's order for 120 more diesel locomotives in addition to the 20 already on order will cost them over 20 million dollars. The NH now operates 360 diesel-electric locomotives and to these will be added 82 units by the end of this year and 58 in 1957. Of these, 20 will be 1200-hp; 30, 1600-hp; and 90, 1750-hp units.

Mack Truck supplied 42% of all diesel trucks sold during 1954, announced P. O. Peterson, president. The sales record represented a historic high, with earnings six times the level of the previous year, and sales 12% better than 1953, the former peak year.

Alcoa rushes expansion of its plant at Point Comfort, Texas, to offset reduced metal output from its Tenn. smelter and curtailed imports from Canada. Drought conditions in the first two areas have created hydroelectric power shortages causing cutbacks in production of aluminum. Point Comfort—gas engine-powered—will have its annual output upped by 25,000 tons. Weather or not, the engines are on the go.

Budd Co. total rail diesel units sales to the end of January reached 271. Since the first of the year, orders for 44 new units were received.

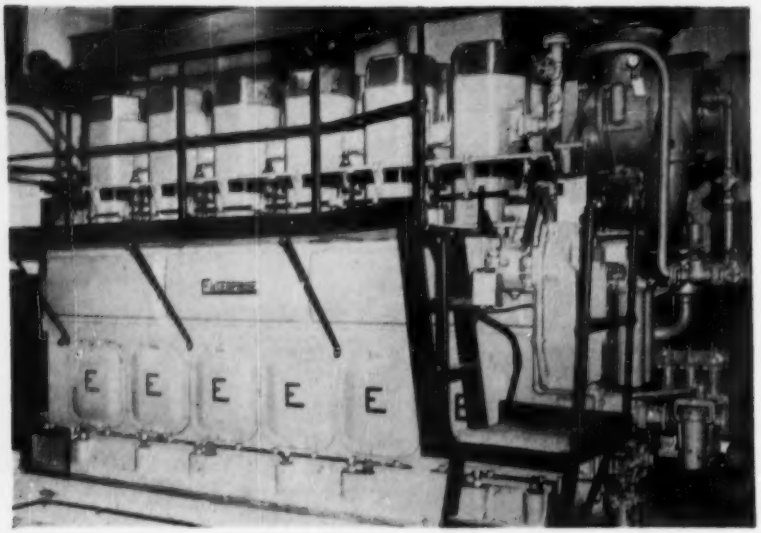
New York City cracks down on exhaust smoke from gasoline and diesel trucks and buses. Commissioner Greenberg, the city's air pollution director, served notice that 36 inspectors will fine offenders from $25 to $500 if their vehicles smoke while stationary or moving 100-yd or more.

Industrial diamond symposium features $4 million in diamonds and a man-made diamond, which will be displayed March 19 by Armour Research Foundation. Co-sponsored by the foundation and the Amer. Soc. of Tool Engineers, the 3-day meet will be held in Chicago.

More new locomotives put in service in 1955 than in 1954, AAR announces. Comparison is 1182 units to 1113 for Class I rails. Out of last year's total, 1172 were diesel-electric and the remaining 10, electric. The peak installation was made in December—157 units—and all diesel-electric.

More new generating plants in Canada in the next 10 years than in its entire history, 's the prediction of J. A. Page, president of the Canadian Electrical Assn. He claims that such will be the case if his country's industry continues its present rate of growth.

A Talgo-type train ran 160 miles on $10 of fuel recently when it went from Chicago to Peoria. The fuel bill with conventional equipment is $29 for this trip. Such economies resulting from the use of these diesel powered trains may tend to lower fares according to the president of The Rock Island Railroad. The trip was made in 2½-hr and a speed of 90-mph was hit.



End result looks like this. A properly-mounted engine ready to go to work. Tips on good installation are given in text.

Tips on Installing a Diesel

Step-by-step notes and photographs by service engineers of Enterprise Engine & Machinery Co. are the basis of a handy manual of practice. Here are pointers that may help you.

DO-IT-YOURSELF hardly extends to the business of installing diesel engines in power generating plants. But at least one major engine manufacturer thinks that standardized procedures may be one way to better installation jobs and better engine performance. The result, Enterprise Engine & Machinery Co. of San Francisco has come up with a series of solid pointers to help its service engineers and its customers for stationary power plants.

The idea began in the Enterprise service department. Henry Bahr, service manager, emphasizes that no one wanted to catalogue instructions on such matters as which wrench to use. Details of that type are part of the journeyman mechanic or millwright's own specialized knowledge. Besides they vary from one engine model to another. Instead the goal was to look for the tricks-of-the trade—the short cuts, the safety precautions and the sequences of work that can be applied anywhere.

It was decided that a model installation should be arranged. Keeping a careful watch on everything that happened as it happened would produce just the type of record from which practical yet standardized procedures could be developed. Last year, early in 1955, the potential model was selected.

The location was Belleville, Kansas, a midwestern municipality that operates its own power generating plant and distribution system. Belleville is 100% Enterprise-powered and it was scheduled to add a fifth unit, a 1455-hp, DSGQ-36 dual-fuel engine, boosting the plant power from 2110-hp to 3565-hp and its generating capacity from 1500 kw to 2600 kw. Belleville's city manager, Earl Whitney, is the former plant superintendent and he was at one time an Enterprise service engineer. This plant, with familiar equipment and familiar operating personnel, provided the perfect example to use in recording, evaluating, and codifying the know-how of an experienced installation crew.

Scope of the Work

To handle the project Enterprise had Edgar Wimbe, a capable service engineer, headquartered at Kansas City, Missouri. Working with him was Glenn Hobbs, foreman for H&H Engineering, Inc., Kansas City, Mo., installation subcontractor. Here was the scope of the work by H&H:

(1) Excavation. Remove portions of plant operating floor and basement floor as necessary and perform required excavation.

(2) Foundations. Construct forms, place and weld 4000 lb of reinforcing steel, make anchor bolt template, fit anchor bolts and sleeves, place 85 cu yd of concrete, and strip forms.

(3) Drayage. Unload engine and auxiliary equipment from railroad car, transport it to plant, move engine into position, and set it in place on prepared jackscrews.

(4) Assembly. Assemble the engine, flywheel, generator armature and stator, outboard bearing, exciter and drive, then level, align, and grout the entire unit.

(5) Auxiliaries. Set all auxiliary equipment on existing or new pads including framework for silencer and intake filter.

(6) Piping. Furnish and install piping for exhaust, gas fuel, starting air, raw water, air intake, lube oil, and jacket water.

Edgar Wimbe's notes and sketches provide the basis of the record made at Belleville and summarized here. But vital also are the photographs taken at key points during the installation by a commercial photographer under Wimbe's direction. With fully descriptive captions they become virtually a do-it-yourself handbook for the education and guidance of other Enterprise service and installation personnel.

Drayage

Engines are heavy things (the one at Belleville weighed 80,000 lb) and moving them around can be difficult unless each move and how it is to be done is planned and provided for. Without certain precautions the work can be hazardous too.

Getting the engine off its rail flat car is a job for rollers. But jacks are needed to raise the skid beams for placing rollers. It's good to have skid beams notched out at each end so that jacks can be set. Otherwise time has to be spent cutting notches.

At Belleville a low-boy trailer took the engine from railhead to the power plant. The truck tractor's winch provided power for transferring the big engine. It was a simple matter to rig the line but Wimbe's experience adds a couple of precautions:

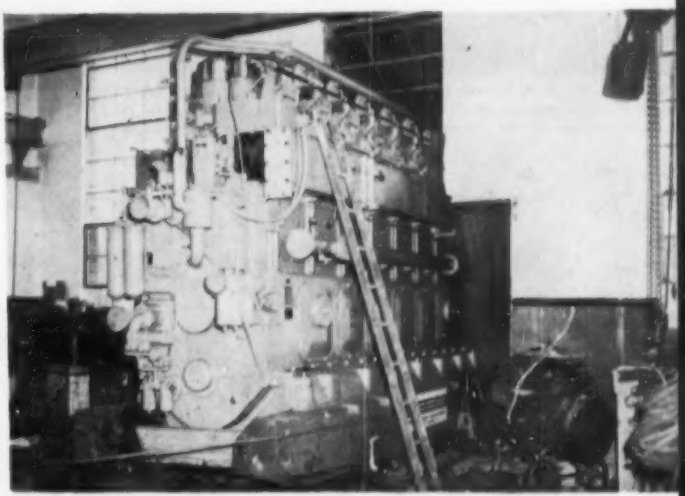
Don't place the line around the engine itself. It could pull the engine right off its skids if the rollers hang up. But even more likely is the possibility of damage to the engine itself if the wire slips.

Rig another line away from the direction of pull and hold a slight strain on it at another winch. This controls movement of the engine as a matter of safety and insurance.

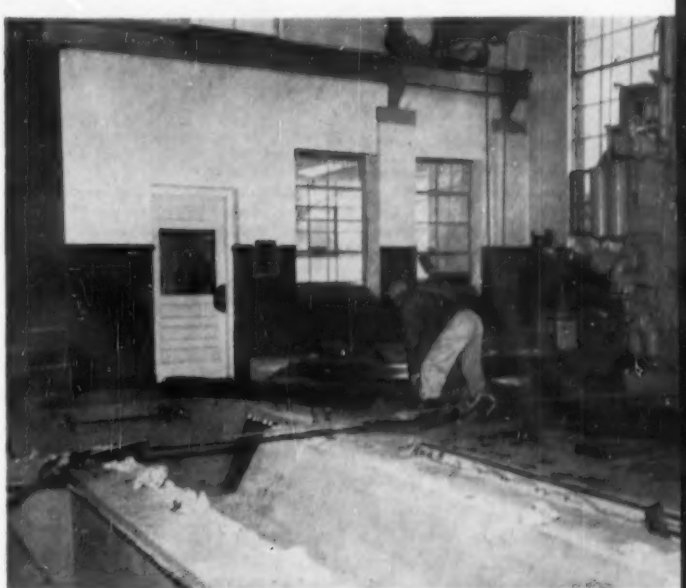
Auxiliary equipment, although heavy, comes in handier packages. The biggest piece is apt to be the armature which weighs about 10,000 lb for the DSGQ-36 engine at Belleville. Jacks, rollers, wire rope and a winch work the same way for these sub-assemblies. The main thing to remember is that the flywheel has holes specially bored for attaching, lifting or pulling cables. The centerbore should never be used in this way as it means sure damage to the machined surface.

At the Belleville plant, planking was laid from the street clear up against the building. This kept the concentrated wheel loads of the trailer from doing damage to the grounds, a point of interest to the city officials. More di-

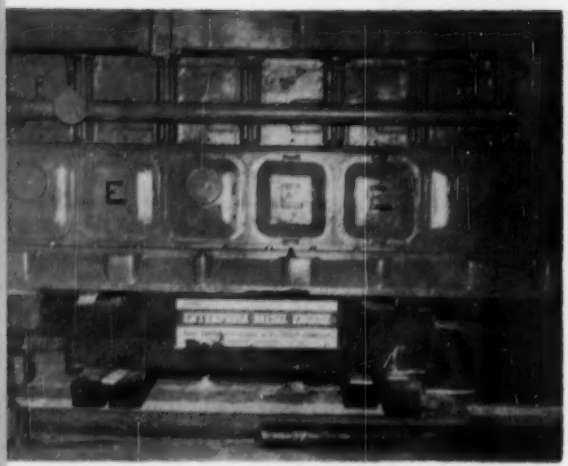
Mounting the engine begins the installation job. Precautions should be taken at the beginning and continued throughout, as is done here. A holdback line should be attached as insurance against any runaway.



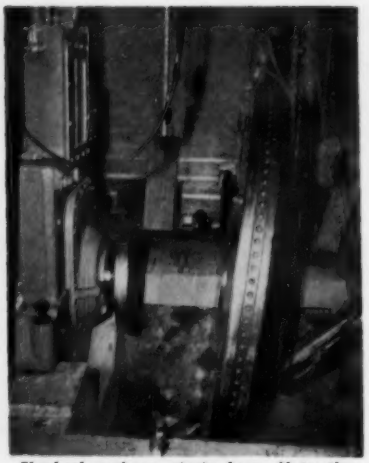
A tight squeeze on the way in. The job is made a lot easier by careful advance planning. This includes adequate opening, good rollers, planking to protect the floor, and floor underpinning if necessary.



In preparing the foundation you should have removed the foundation bolts and stuffed the holes with rags. This will mean no extra lift needed on the engine and the bolt holes will remain free of fouling.

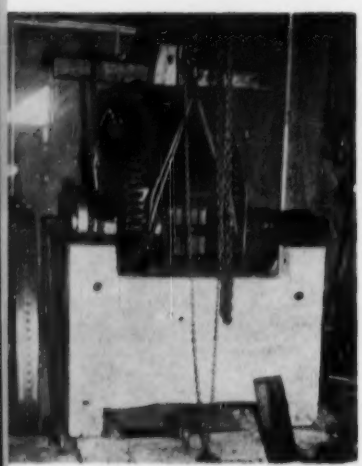


Removing the skids is done by jacking up the load and transferring it to the cross timbers. Use of skids that have been sawn off is wise, as center portion can be cleared. Jacks let engine down on their screws.

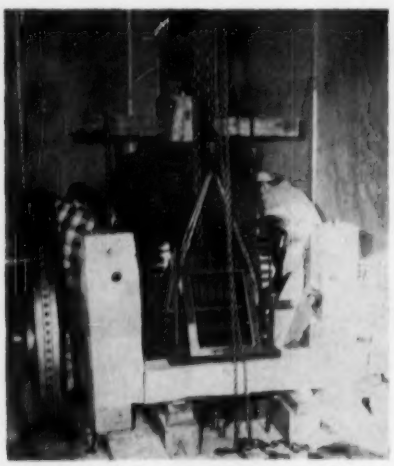


Flywheel makeup starts here. Note the use of sling through specially provided holes. With piston nos. 1 and 6 at TDC, assembly marks match with flywheel.

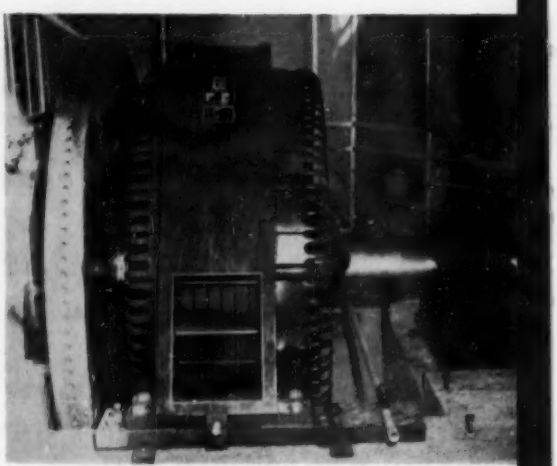
Armature goes into stator this way with chain hoist holding one end as skid is cut away. More blocking is placed, keeping windings from fouling each other



teady to lower beside flywheel, roughly assem-bled generator is held together by cross tim-ber and chain binder. Rigging on near side is taking half-load. Next, the skid is cut away.



Nearly in place, generator rests on one remaining timber of skid. When that goes, soleplate can be set and generator lowered. Then it is ready for shaft make-up and alignment.



Generator alignment flexibility is evident. Wedges are driven under the soleplate and lateral positioning not yet completed.

rectly of interest to the H&H Engineering crew, it assured keeping the trailer at the proper height for smooth unloading by planks and rollers to the plant floor.

Belleville's best route from outside of plant to engine foundation meant crossing a portion of floor having a basement beneath it. The problem may not be a typical one but it emphasizes the need for thorough planning. Underpinning is the answer and it must be done painstakingly. A tight system of stulls, caps, and 4 x 4-in cribbing, all wedged into place under the plant floor, means minimum deflection under load. And this is important for even structurally insignificant cracks can be unsightly evidence of slipshod workmanship.

A straight-away pull takes the engine into the plant. After that a variety of oblique pulls may be necessary to get past existing equipment or to turn the engine bodily. Rollers can be cocked when they're set down in front of the load. Other engine foundations should provide anchorage for snatch blocks and pulleys.

When sidewise strain is necessary the rope should never

be made fast to the skid beam in the direction of the pull. The extra friction involved in oblique movements means a much heavier pulling load, easily enough to pull the skid beams apart, dropping or upsetting the engine. To avoid this, carry the rope around the engine and hook it on so that the pulling strain tends to squeeze the skid beams together against their spreaders.

Getting the engine off its skid timbers and down on the jackscrews requires some see-saw jacking and a few well-planned saw cuts. Here's how to do it with the least lost motion:

(1) With jacks under the notched ends of the skid timbers jack the engine up one end at a time and place a pair of cross timbers underneath at the quarter points.

(2) Cut away the ends of the skid beams and replace the jacks which now bear directly on the engine base.

(3) Take the engine weight on the jacks at one end and remove the near cross timber. Keep temporary blocking beside the jacks, nearly to the jack height, as a safety measure in case of failure. Repeat this step at the other end. The engine is now supported completely by jacks and the center section of the skid beams can be removed.

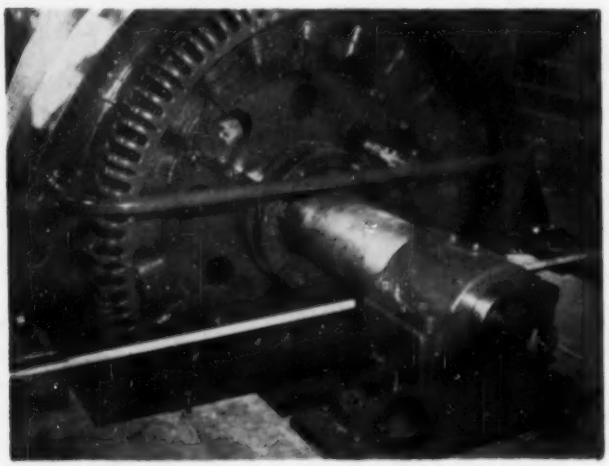
to jackscrews. The remaining bolts and nuts should be left slack until after grouting. Setting them down tight at this point would tend to deflect the engine base and introduce undesirable stresses.

Assembly

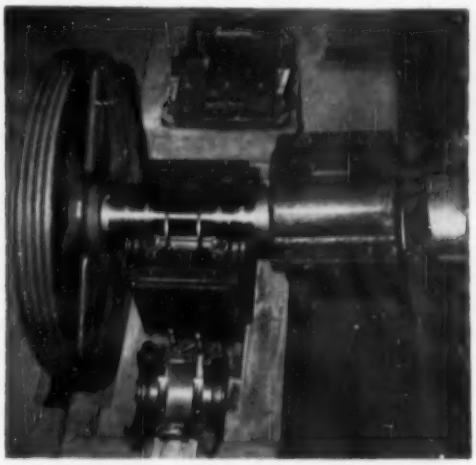
The payoff in standardizing practices comes where the work is the most precise. Assembly of auxiliary equipment involves a great deal of handling and re-handling of awkward pieces, yet with great care in making up machined surfaces. And aligning them is inherently a matter of micrometer precision.

Flywheel installation is routine. But here again it must be remembered not to foul the centerbore by attempting to pass slings. White lead on the OD of the crankshaft flange makes for a smoother make-up job. Basic alignment is provided by dowels in a pair of opposing bolt holes while bolts in another opposing pair of holes are used to draw the flywheel into position. The flywheel should be kept plumb and squared up at all times to prevent binding.

The key to smooth assembly of the generator armature



Level bubble on bar between soleplates (lower left), helps in setting air gap. Shown is wedging and adjusting system on outbearing.



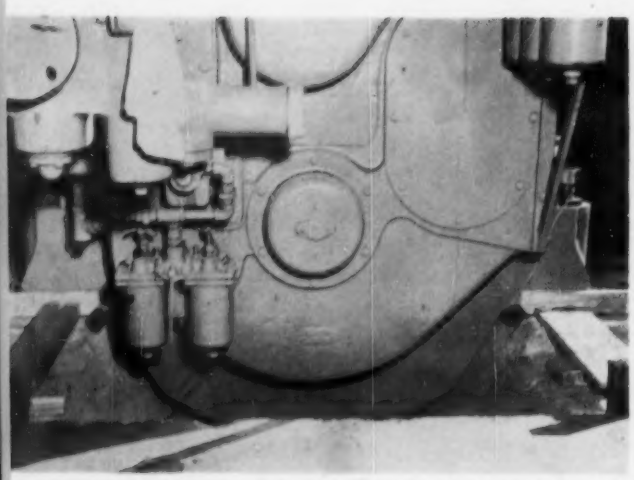
Opened-up outbearing reveals many clearances and alignment check points. At rear is installed exciter footrail.

(4) Lower away by jacking at alternate ends 2-to 3-in at a time so that the load is never far from level. Remove temporary blocking a little at a time.

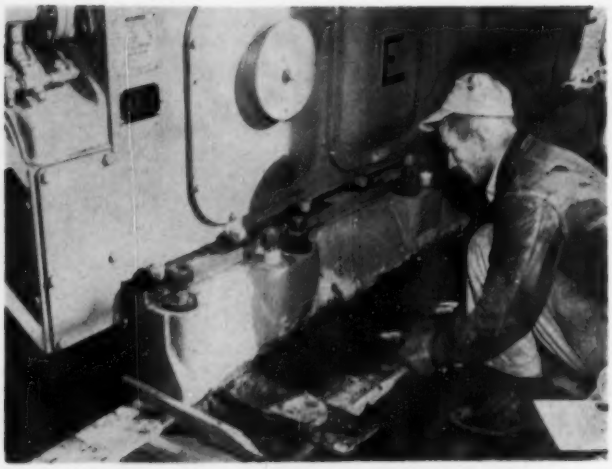
The last 1½-in is the most important as the engine weight is let down on its jackscrews and precisely leveled. Wimbe notes two or three points for this work. First, use plenty of white lead on the jackscrews and their threads. Second, leave at least 1-in clearance under the engine all around. This will be packed with grout later on. Third, tighten down only on the foundation bolts that are next

and stator is the long-end of the armature shaft. It should be inserted first. Pictures accompanying this summary show how the work is done. An important trick is the manner of cutting away the armature skid as it is rolled up against the stator. A chain hoist replaces this point of support and a second chain hoist takes over when the long-end of the armature shaft projects from the stator on the far side.

Lowering the generator into place can be a crane job if the necessary lifting capacity is available. If not, the



Forms for grouting include conventional boards and blocking, also a long piece of pipe wired tightly along edge of pit under the engine.



Rods, blocks, and mallets force grout solidly and firmly beneath engine base. Note nuts run down only on bolts adjacent to jackscrews.

procedure used at Belleville is safe and accurate. Pictures of the start and finish show what was done. Lift up one side of the generator and cut away one side timber from the skid. Repeat this on the other side then alternate back and forth lowering the generator one side at a time and 3-in at a time until it is in place. (Succeeding alignment work is speeded if generator sole plates can be placed and adjusted for height before the generator comes to rest.)

Make-up to the flywheel is similar to flywheel installation but has the added work of reaming the bolt holes and setting the permanent bolts and nuts. At this time also the outboard bearing is placed leaving the armature freely suspended at its permanent points of support.

Alignment of Generator

Remaining work should follow a definite succession of steps in order to avoid later backtracking and re-adjustment. The basic operation is alignment of the armature shaft with the crankshaft. After that the generator stator can be precisely positioned to give the correct air gap at all points between windings of armature and stator.

With the engine firmly based all shaft adjustments must be performed at the outboard bearing (or outbearing). Accuracy of the work is measured by strain gauge readings between crank webs of the shaft. Ideally, the readings should be identical at all points in a revolution of the crank. Plus or minus readings of the gauge at each quarter point indicate which way the outbearings should be nudged or wedged to achieve perfect alignment. At the same time a feeler gauge guides the longitudinal positioning of the outbearing to keep all clearances equal. The engine thrust bearing takes care of end play.

Stator adjustment includes equalizing the air gap not only radially but from end to end. To do this the stator is raised or lowered, shifted sidewise as necessary and squared up laterally to put its axis exactly in line with the armature.

Foundation Grouting

With all elements level and aligned, foundation grouting remains as a final step. A basically simple procedure, it can make or break the job. Firmly packed grout means less chance of immediate adjustment to the alignment of parts. It also means permanence of the installation and reliable, vibration-free operation.

The difficulty in grouting is in providing adequate forms to hold the grout during packing. Boards can easily be wedged into most positions around the outside of the engine and its auxiliaries. Underneath the engine base, at the edge of the pit, is another story. Accompanying pictures show how a piece of pipe can be tightly wired into this narrow space to close it off.

When the grout has set, forms can be stripped, jackscrews backed off and all foundation nuts run down tight. The test of the grouting then is a quick recheck of alignment—feeler gauges at clearances and a set of strain gauge readings on the crankshaft again. Some minor adjustment may be necessary.

Conclusion

The historical record from Belleville, Kansas, the basis of these tips and pointers, is remarkably smooth and free of difficulty. The reasons are obvious. Thorough planning by a capable service engineer is one. Another lies in the experience of the installation crew and in their systematic application of knowledgeable workmanship.

Ed Wimbe's notes and photos have built the basis of a helpful manual of stationary engine installation practice. Studied by other service and installation men these tips will mean simplified and safer jobs in the future and better performance of Enterprise equipment for the owners. Belleville, Kansas, profits from being a shining example but the ultimate payoff is in competence for Enterprise personnel, prestige for the company and performance for its products.

I-H new "75" in action, showing the redesigned cutting edge that works on the dozer blade principle. Dirt boils into corners and fills the bowl rapidly.

From a comfortable foam-rubber seat, operator enjoys good visibility both front and rear.

Improving the I-H Payscraper

Two new models now in production incorporate design changes for easier, more efficient operation.

CLOSE customer — engineering cooperation in the field and on the job was instrumental in producing two new models of I-H self-propelled, rubber-tired Payscrapers. Both of the additions are powered by Cummins diesel engines, turbocharged with PT fuel injection applied through spiral bevel gears in a four-pinion differential with a sun gear for planetory final drive. The "75" engine is rated 262-hp while the "55" uses a smaller 172-hp unit.

Currently in production, delivery is anticipated in early March. Newly designed-in features promise added service and utility.

The bowl design incorporates the dozer blade principle. The cutting edge boils dirt into the corners, heaping a full load rapidly. Apron lift is now higher, and ejection is cleaner and faster. In addition the push block directs thrust more efficiently and protects the tires and rear of the machine.

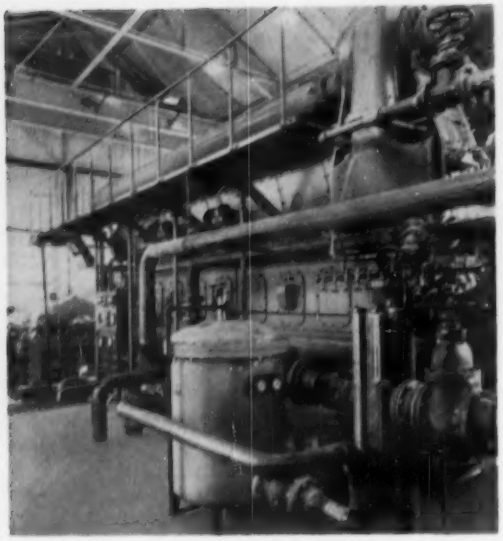
Clutch is advanced design, combining powdered metal and ceramic materials similar to those used to brake jet aircraft. Slippage is reduced and clutch adjustment is minimized.

Operator comfort and convenience have not been overlooked, either. Sitting on thick, foam rubber the operator enjoys good visibility with control grouping in easy reach. Air brakes, with a hand lever to allow "walking", and International's "Hydro-Steer" hydraulic power-steering combine for his added safety and ease.

Both the "75" and the "55" have been completely field tested, and International expresses confidence that these improved models will do a better job of moving dirt at lower cost.

New I-H Payscraper Specifications

	Model "75"	Model "55"
Capacity	Heaped 20-cu yd Struck 15-cu yd	Heaped 14-cu yd Struck 10-cu yd
Capacity w/ Sideboards	Heaped 22-cu yd Struck 18-cu yd	Heaped 15-cu yd Struck 12-cu yd
Speed Range	2.7 to 23.8-mph	2.8 to 23.7-mph
Horsepower	262-hp at 2100-rpm	172-hp at 1800-rpm
Net Weight	53,500-lb	39,500-lb
Length	39-ft 4-in	34-ft 0-in
Width	11-ft 5¾-in	10-ft 10½-in
Height		
Loading	9-ft 9-in	8-ft 11-in
Carrying	10-ft 2-in	9-ft 4-in



Remotely-controlled, automatically-operated C-B turbocharged engine type LSV, drives through gear reducer to compressor on other side of firewall.

Automation Hits Gas Pipelines

Fully-automatic, remote controlled gas pumping station shows trend of future pipeline operation.

SUCH up-to-the-minute terms as "automation" and "satellite stations" now apply to the natural gas industry. "Automation" is descriptive of Gulf Interstate Gas Company's full-automatic pumping station at Stanton, Kentucky. It is a "satellite" station since it is controlled from the Clementsville, Ky., station, some 80 miles distant.

Development of the automatically-controlled pumping station is a joint achievement of Gulf Interstate Gas Company and The Cooper-Bessemer Corporation. Cooper-Bessemer's type LSV, 16 cyl., 4-cycle natural gas engine drives one of their centrifugal compressors through a speed increaser. These were combined in a single completely-unitized installation, operating entirely on its own auxiliary accessory equipment.

The big engine, delivering up to 4550 hp, provides the station with enough power for handling over 500-million cu ft per day at pressures up to 950 psi. Yet the compactness of the engine-compressor combination shows economies in space, foundation requirements, etc., since normally 2 to 5 conventional compressor units would be needed to duplicate this pumping capacity.

Because of its high capacity this Stanton, compressor station acts as a booster. It helps meet peak demands during winter by partially unpacking the line. This gives the same peak shaving benefits of underground storage. The unit works as a conventional compressor during normal periods.

Operational Features

The type RFB-24 centrifugal compressor is driven through a speed increaser by the type LSV, 16-cyl, spark-ignited natural gas engine. The engine is turbocharged and has a special way of cooling the intake air after leaving the turbo-blower. By allowing the air under pressure from the blower to expand into a large intake manifold enough cooling is obtained so that no intercooler is needed.

With expansion-turbocooling, intake air temperatures are reduced without the high consumption of water usually required on conventional systems. This is of particular advantage where water is scarce. Cooling this intake air increases the density of the air charge permitting more fuel to be burned. This results in an increase in horsepower without a corresponding increase in the heat load on the engine. This plus the engine design features makes for a reported economical fuel consumption of slightly over 6000-btu per bhp hr.

The compressor unit operates entirely on its own auxiliary equipment. But it can be controlled by a direct wire from as far as 80 miles away. By remote control, line valves can be opened and closed, the unit started or stopped and cut into or out of the line. The engine speed and gas discharge pressures can also be controlled in this way.

All essential operations are telemetered to the main station. Improper operation of any of the unit systems is immediately signaled to the main station control panel by sight or sound alarms. Then if necessary the unit is automatically shut down. Let's see how some of these operations actually take place.

Starting Procedure

To start the automatic engine-driven compressor unit, the controls at the main panel in Clementsville, Ky. first

open the line suction valve. The blow-down valve is then closed and line pressure builds up in the compressor case. The discharge valve is closed next and this actuates a start switch which energizes the engine starting circuit. At the same time the engine auxiliaries are also automatically started. For example, the lube oil pump is started and circulates oil from the gear sump of the speed increaser through a gear oil heater.

Oil level is automatically maintained in the seal oil tank for the compressor shaft sales. Additional oil is automatically diverted from the gear sump if needed. The main start switch can't actuate the engine starting circuit unless all line valves are set properly and all auxiliaries working right. Only then can pushing the start switch button at the main station initiate the engine starting sequence.

This is done by energizing an automatic 3-way air-solenoid valve which admits starting air into the engine. After the engine has picked up speed and run for a set purge period the ignition is turned on. The fuel gas safety shutoff valve and starting fuel valve are then opened to admit fuel into the cylinders. After the engine fires and reaches idling speed the engine speed control switch energizes the control circuit of the main fuel gas valve. At the same time the starting air is turned off and the main fuel valve opens.

At idling speed gas pressure acts on the diaphragm of a 3-way valve in the control air line, on a shut-down cylinder on the gas regulating valve and on a pneumatic link in the governor control mechanism. With the gas regulating valve working and control air pressure on the pnuematic-governor the engine idles through a warm-up period, After warm-up the engine is regulated to a pre-set speed by an automatic timer.

When the engine is running at the proper speed the line valves are opened to load the engine. First the discharge valve is opened, then the suction. The discharge pressures which are set on the main control board are held automatically by the engine governor. They can be varied by changing the engine speed.

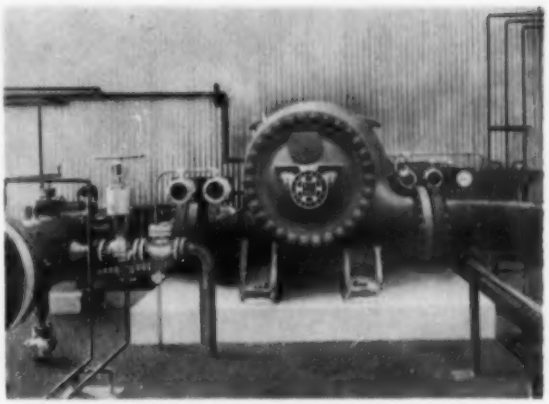
Shutting Down the Unit

Pushing the stop button at the main station sets up the shut-down sequence. By de-energizing the main fuel gas solenoid the main fuel valve is closed. The safety fuel gas valve then is closed. Next the line suction and discharge valves are closed as the engine speed drops and the ignition is grounded, shutting off the engine. When the suction and discharge valves are fully closed the blow-down valve is opened to relieve the pressure in the compressor.

In addition to remote operation from the main station at Clementsville, the Stanton station can also be worked manually. A complete switch panel is available to perform manual starting with or without electric power from the REA system which is the only source of supply to the station itself.

Safety Devices

Shut-down safety devices stand guard over the entire unit continuously around the clock. They not only sound an alarm and turn on a look-out light at both stations but also shut-down the engine, close the side gate valves and blow down the yard piping.



C-B type RFB-24 centrifugal compressor with automatic valves controlled from 80-mi away to permit loading and unloading.

If the engine is shut down because of a break in the pipeline or fire, it can be restarted only at Stanton. However, if the engine is stopped because of overspeeding, low oil pressure, high discharge pressure or high temperatures it can be restarted from the main station at Clementsville.

Although alarms will go off at both stations, the engine will not shut down if there is low oil level, loss of water pump seals, low water level, low air pressure, low seal oil level or loss of the fuel gas heater pilot which shuts down only the fuel gas heater.

Trouble lights go on at once in case of AC power loss, REA power loss, gas surge in the compressor, variation in discharge pressure of 5-lb off set valves and loss of telephone lines. Any variation in suction, discharge or starting pressure is telemetered to the main station immediately. The same holds true for any variation in engine rpm or the setting in the discharge pressure controller.

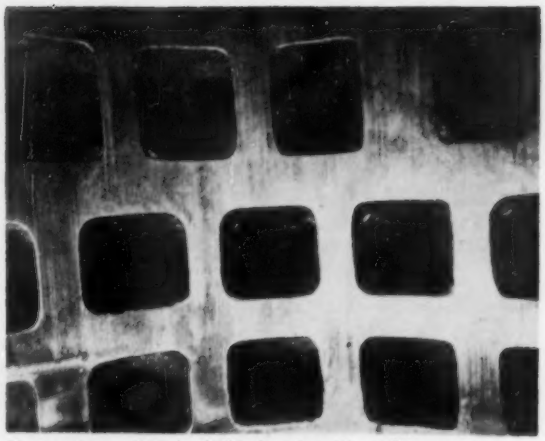
Conclusion

Apparently there is a trend toward increased use of automatic, remotely controlled unitized installations such as this. Although the above installation is the first one on which we have received data, reports indicate that at least one more has been completed and several others are under construction.

Another trend appears to be in the direction of larger individual units. Having fewer units makes it simpler to operate them automatically by remote control. Economy in installation cost, low fuel consumption and low expected maintenance costs make this type equipment desirable.

When this equipment is automatically operated and remotely controlled it is especially suited for isolated, difficult-to-get-to places where unattended service is necessary.

Blocked ports of cylinder liner is condition commonly experienced in 2-cycle engines using residual fuels.



Liner ports are clear in similar 2-cycle engine using residual fuel but in which Barsad was used for about a year.

Improving Residual Fuels

By R. S. Norris,
Fuels and Lubricants Consultant

Use of residual fuels in diesels offers economy — and headaches. Suitable preparation answers part of the problem. But troublemakers—sulfur, vanadium, sodium—may still be present after cleaning. Additives offer one approach to a solution. Here are some results obtained with one such product.*

THERE is no "royal road" to burning residual fuels in diesels or gas turbines. But there is a general road map, drawn by experience, and certain "bridges" over rough spots have been supplied by additives. Knowing the problems and the aids available will help you get to your goal—and it can be a pretty important economic one.

First you must clean your fuel. It is recommended for diesel and gas turbine installations that the fuel be "cleaned up" as much as possible by means of filters, strainers, purifiers, clarifiers, heaters, etc., to remove the insoluble materials. Several suitable systems have been worked out on an individual basis and the experience of the engine manufacturers is embodied in a schematic fuel system diagram proposed by the Diesel Engine Manufacturers Association, (DIESEL POWER, September, 1955.)

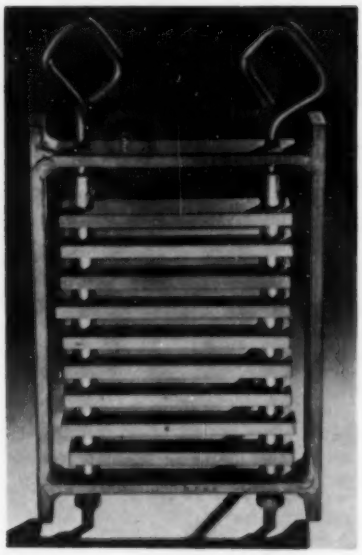
However, in addition to this mechanical conditioning, it is also necessary to counteract corrosive effects of the oil-soluble compounds of sulfur, vanadium, and sodium. These latter compounds, being oil-soluble, cannot be removed by physical means and therefore must be counteracted by an effective fuel additive.

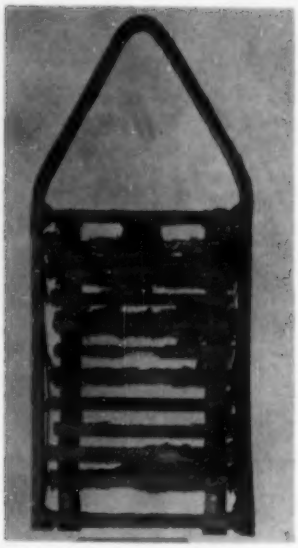
Corrosion problems caused by these sulfur, vanadium, and sodium compounds are not confined to any specific application of residual fuels. Gas turbines for marine applications must use low-cost residual fuels, and yet rotor buckets and nozzles are likely to be corroded by minute quantities of vanadium and/or sodium present in the fuel.

Operators of diesel engines burning similar fuels are observing a wastage, of metal from piston heads resulting in cracked pistons, and while it has often been passed off as "burning" due to improper functioning of the fuel valves, a closer inspection reveals pitting and corrosion has taken place. Similarly, a close inspection of exhaust valves and flame rings from certain types of engines burning heavy fuels, reveals this same type of pitting and corrosion has taken place.

Operators of oil-fired boilers for steam turbines in both stationary and marine service are confronted with a serious problem of corrosion attack of steels, including high-

*Supplementary data to an article by the same author entitled "Residual Fuel Oil Improvers" that appeared in DIESEL POWER, June, 1955.





Test racks of various alloys before and after 707-hr exposure in superheater section of oil fired boiler to check resistance to corrosive attack with and without fuel additives. Sectioned alloys at right show degree of disintegration. Scale and fly ash are seen between some alloys.

Photos — Courtesy of International Nickel Co.

chrome alloys, in the superheater tubes, spacers, and hangers, when the metal temperatures approach or exceed 1200°F. This corrosion is accompanied by slag deposits which cannot be removed by air or steam soot blowers. The photograph reproduced here shows the wastage of metal and reduction in wall thickness from a super-heater tube.

Therefore, these corrosion problems observed in gas turbines, diesels, and boilers, although widely different in application, are all related to the corrosive compounds present in the fuel. As was pointed out in the previous article, vanadium and sodium attack occurs when these compounds are in the liquid state. If you can raise the melting point of these compounds sufficiently, they will pass harmlessly out of the combustion area. This was the objective in formulating a suitable additive—the one known as *Barsad*.

Laboratory Tests

It's been shown that the problem is one of fuel rather than of application. Thus tests apart from the engine, such as micro-burner and ash-fusion tests are valid. Following are the results of such tests using *Barsad "D"*, formulated subsequent to the earlier article.

Micro-Burner Test "A"—This was a 100-hr test at 1450°F using residual fuel oil containing 140 ppm (parts per million) of vanadium, as metallic vanadium, and 80 ppm of sodium. *Barsad "D"* reduced the corrosion (weight loss) of 25-20 alloy steel substantially even though this sodium content far exceeds the maximum limit established by one gas turbine manufacturer. Their limit is a maximum of 10 ppm and preferably not exceeding 5 ppm.

Fuels such as this test fuel would normally necessitate a water-wash and centrifuging treatment before use. Incidentally, this is the type of installation proposed for the Liberty Ship gas turbine conversion program.

Micro-Burner Tests "B" — These were 100-hr micro-burner tests run in similar type burners to those in test "A" except using a residual fuel oil containing 375 ppm of vanadium. Test specimens included Inconel X and Stellite 21 alloys in addition to 25-20 stainless alloy steel. The use of *Barsad "D"* in this test was better than 90% effective in reducing the corrosion of the Inconel X and the Stellite 21, but was less effective on the 25-20 alloy. This test points out the importance of correlating the fuel additive effectiveness with the metallurgical aspects of the problem.

Ash-Fusion Tests—The new additive formulation has proven to be extremely effective in raising the ash-fusion temperature of a 375-ppm vanadium fuel ash. Results of tests with the fuel alone and with different additive formulations follow:

	Initial Melt °F	*Complete Melt* °F
Fuel Ash, no Additive	1200	1210
With Barsad "S", ashed	1400	1600
With Barsad "B-1", ashed	1850	2100
With Barsad "B-2", ashed	2025	2100
With Barsad "D", ashed	2300+	2300+

Since the thermocouples in the above test apparatus only recorded to 2300°F the exact fusion temperature of the fuel ash with the *Barsad "D"* could not be determined. But 2300°F is certainly out of the range of any metal skin temperatures now existing or comtemplated.

Case Histories

These field reports all concern motorships. This is not surprising since the marine industry is one of the largest users of residual fuels and in this service the number of diesels burning the bunker fuels outnumbers by far the similarly-fueled land-based installations.

Motorship "A"—Propulsion power is provided by a 9-cyl, double-acting, 2-cycle, 25 3/16-in by 45 11/16-in Fiat engine. This ship experienced rapid disintegration of the flame rings in the lower combustion chambers, due to vanadium attack. Attempt was made to solve the problem metallurgically by using a flame ring of a high-chrome alloy. It lasted only 57 hours. Since using *Barsad*, the flame ring problem is under control.

Another and most gratifying result observed on this engine was the complete freedom from troublesome carbonaceous deposits in the cylinder ports since using the additive. Previously, even when operating with diesel fuels, as much as 50% port obstruction was common. I believed that this deposit-forming condition is, in a way, related to the fusion phenomena of the ash from the fuel and lubricant. The additive has been used for approximately 8000 hours of operation with clear exhaust reported at all times and no carbon deposits on fuel nozzles.

Motorships "B" and "C"—These are sister ships to Motorship "A" and reports to date after approximately 5500 and 2500 hours of operation respectively indicate comparable satisfactory results. Motorship "B" reported some noticeable reduction in cylinder wear and piston ring breakage and wear, although exact data was not possible since the cylinders had several thousand hours of prior service at the time of additive application. Such results could be expected, however, with the improved deposit and port-plugging conditions. The chief engineer of Motorship "C" reported he was favorably impressed with the cleanliness of the engine parts.

Other examples could be given, some showing that the harmful effects of the sulfur, vanadium and sodium compounds are not necessarily confined to the residual fuels. For example, on Motorship "D" powered by a Burmeister & Wain 9-cyl, 2-cycle 24⅜-in by 45½-in single-acting engine, the piston heads were corroded away by as much as ⅞-in. The engine was burning a distillate fuel known to contain some quantity of vanadium. *Barsad* was effective in greatly reducing this metal loss.

Conclusion

Additives appear to offer the best chance to live with these harmful components of residual and other fuels. Many approaches have been used. Addition of such compounds as magnesite, alumina, dolomite, kaolin, etc., in the form of either slurries in oil or water, or as powder injected into the gas stream, is known and has been reduced to practice with varying success.

It is my opinion, however, that particle size and intimacy of contact between the metallic portion of the additive and vanadium and sodium component of the fuel ash are of primary importance. *Barsad* additives (pat. pending) were compounded to accomplish this function by achieving dispersion in the fuel of a relatively high concentration of infusible materials in an oil-soluble, liquid form. However, no claim is made to have solved all the corrosion problems which exist—yet.

Diesel engines furnish power for mechanical refrigeration of PFE freight cars to insure against food spoilage in transit.

Diesels Power Refrigerator Units

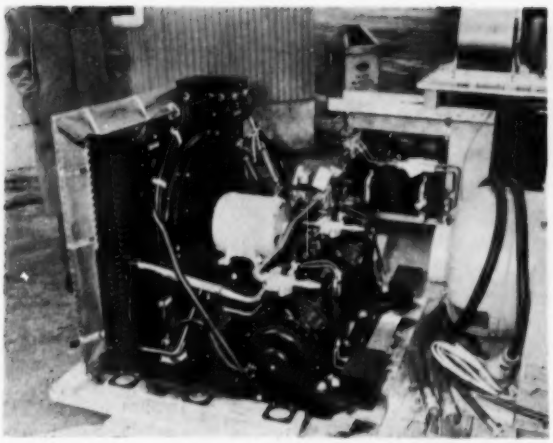
Pacific Fruit Express minimizes danger of frozen food spoilage in transit with modern cars having diesel-powered mechanical refrigeration units.

GROWTH in the frozen food industry has been phenomenal. Within the past several years more fresh food has been shipped greater distances than the total in all the years of the world's history.

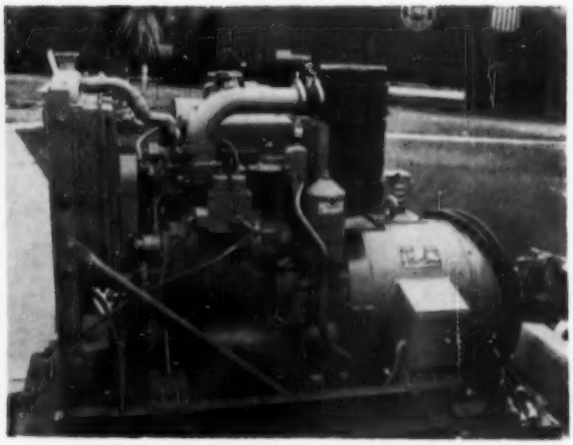
The transport of fresh food involves the possibility of spoilage in transit. To bring such risk to a minimum the railroads are relying on the dependability of the diesel engine for mechanical refrigeration power, and the older salt-and-ice method is gradually being replaced.

Such is the case with the Pacific Fruit Express Co. who along with some 38,000 ice refrigerated freight cars, presently operates 337 mechanically-refrigerated cars. The latter handle frozen foods at zero temperature. In addition, 175 large cars heretofore using ice and salt for protection of low-temperature commodities will be converted to mechanical service this year in the company's own shops. Construction of 200 new, large mechanically-refrigerated cars has been authorized. These mechanical cars are all of quite uniform design insofar as running gear and superstructure are concerned. They have inside dimensions as follows:

	Present Cars	*Proposed 200 New Cars*
Length	44′ 6″	44′ 6″
Height	7′ 3″ & 7′ 3½″	8′ 0″
Width	8′ 6″	8′ 0″
Eff. Lading Cap.	2742 & 2758 cu ft.	3026 cu ft



Compact refrigerating unit has separate motors for compressor, condenser fan, evaporator and air circulating fans. Holds car at 0°F.



A 34-hp diesel-driven alternator feeds motors through central panel. Panel has defrost controls, car thermostat, starter switches.

Insulation is 7-in in walls and floors, 10½-in in roofs. A plenum chamber from 6 to 9-in deep runs the length and width of the ceiling, through which refrigerated air flows to wall channels connected with return passages under the floor. The cold air flow is thus sealed from the lading compartment and quickly conducts infiltering heat to the cooling coil (enclosed in this same air circuit.) This permits loading and unloading without frigid air blasts striking the workers. Inner lining adjacent to the lading compartment is plywood with sheet aluminum forming the ceiling plenum.

The mechanical units in general follow conventional design. A diesel engine rated at 34-hp is direct-connected to a 220-v alternator supplying power for separate motors driving compressors, condenser fan, evaporator and air circulating fans.

Compressor equipment varies, some cars being equipped with a single 10-hp unit, some have two 5-hp units and some two 7½-hp machines. Where two compressors are employed, either or both come into service as temperature requires.

Operating Principle

The diesel-electric power plant produces 220-v, 60-cycle, 3-phase alternating current which flows to the central power distribution panel on which are mounted magnetic starter switches, defrost controlling mechanism, car temperature thermostat, etc. If the thermostat calls for cooling, one or both compressors start automatically and the refrigeration process begins. Once started, the diesel driven alternator operates through to car destination whether compressors are operating or not.

Cooling

Low pressure Freon-12 refrigerant is circulated through the evaporator where it picks up heat from the warm return air circulated by the blower and the refrigerant boils. The hot refrigerant is removed by the compressor and in the process is salvaged and used again. Air that has been cooled in the evaporator is now circulated through the top plenum chamber and down the sides and end wall. From here it again returns to the evaporator through an air space under the lading floor. This process continues until the car temperature has dropped to the desired level then the car thermostat automatically stops the compressors.

Defrosting

In the event the cooling coil becomes coated with ice the defrost mechanism located on the electrical control panel will automatically stop the refrigeration system and the blower. Heat is then applied to the evaporator until all ice or frost is removed. When the evaporator reaches a predetermined temperature a thermostat stops the defrost cycle and the refrigeration process begins again.

Maintenance and Inspection

Before a mechanical car is loaded it is given a pre-trip inspection consisting of a complete check of the diesel-electric power plant and its auxiliaries. Tests are made of the refrigeration operating pressures, heating system, and electric control panel. All mechanical equipment must meet strict operating specifications before being released for service.

Every 1000 hours of operation, the fuel oil and lubrication oil filters as well as engine lubrication oil are changed. The refrigeration system is leak-tested with a halide torch and all auxiliaries are tested. Every 5000 hours of operation the diesel engine is given a thorough tune-up.

When a mechanical car has been inspected and released for service it can operate continuously for at

(Continued on Page 56)

Irrigation has transformed Texas' lower Rio Grande Valley into rich farmland. One laborer waters 12-acre citrus grove in one day.

Six F-M mod. 31AD8½ dual-fuel engines pump 202,500-gpm at the main pumping station of the Hidalgo County Water Control District #1, located at Penitas, Texas.

Irrigation Saves Texas Desertland

F-M diesel-powered pumping units have reclaimed 4226-square miles of arid land from the desert. Cotton has replaced cactus as the area's main crop.

IF you live in a desert, water is the thing that makes the difference between harvesting a crop of melon or cursing a field of mesquite. In order to grow crops you need water, and diesel engines are pumping it to where you need it more dependably and at the same time more cheaply. If you farm, it has to be dependable because your crops will not wait until you are ready to water them; and it has to be cheap or you will price yourself right out of the market.

Farmers in the southern part of Texas, in the Rio Grande Valley, were faced with an irrigation problem. Good alluvial soil and an eleven month growing season means nothing when there is not enough water to grow a crop. Dependable power at a price they could well afford to pay—diesel power—made it profitable to irrigate 650,000 acres regularly from the Rio Grande, which is one of the hardest-worked rivers for that purpose in the world.

Irrigation is a big, serious business in the valley. The entire economy depends upon the continuous trouble-free operation of its pumping equipment. Without effective irrigation the economy would be sick indeed; without any it would collapse. Of the 34 irrigation districts all but three are diesel-powered.

Water District Organization

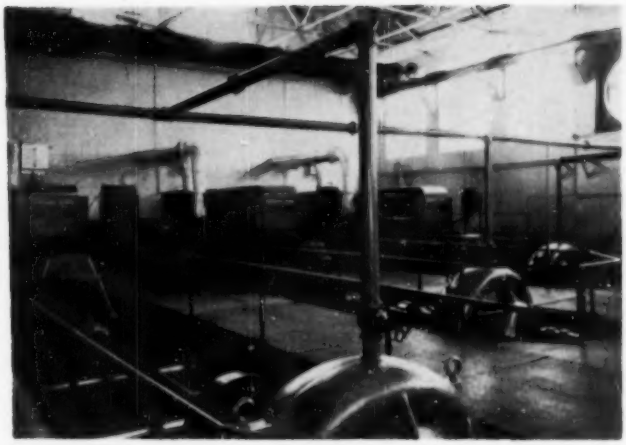
Since 1876, when a sugar cane planter named Louis Brulay, near Brownsville, began to water his crops, the formation of the large water companies began to accelerate and to spread westward.

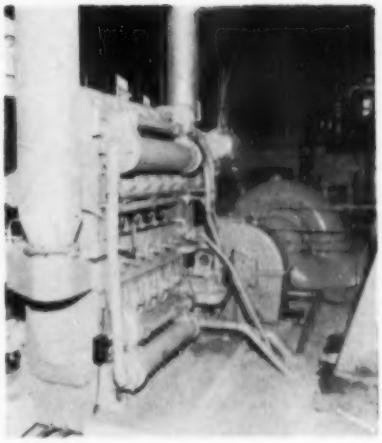
Each company digs its own canals and provides its own pumping and control facilities. It operates as an independant private agency responsible to its individual members; but is dependent upon the state water commission for water rights and is bound to operate within the framework of the International Boundary and Water Commission.

Today it is this commission that administers the waters of the Rio Grande. Treaty with Mexico entitles the United States to 58.6% river yield, normally 1,500,000 acre feet, or enough to irrigate a maximum of 698,000 acres. To guarantee adequate supply over the dry spells, Falcon International Dam is completed and the construction of two others is underway. A 78,000-acre lake holds the surplus water for later use.

A Specific Example

The large Hidalgo County Water District #1 gives a fairly representative picture of valley irrigation districts.

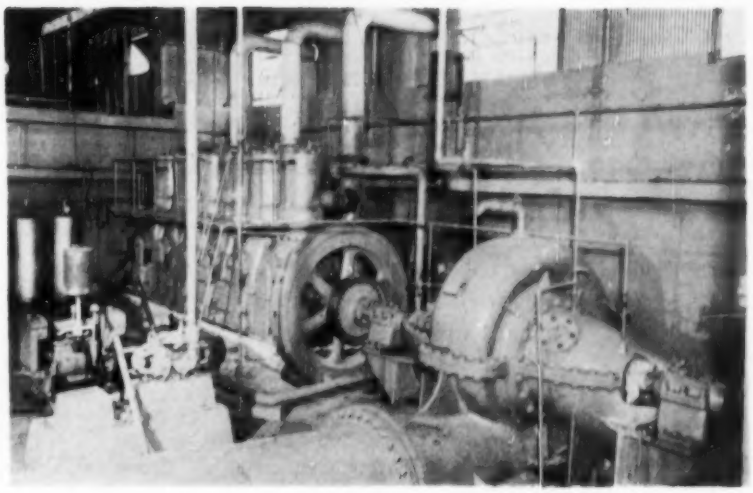




Three F-M 31AD8½ dual-fuel 8-cyl engines, shown above, are among six at Penitas pumping station. All use low-cost natural gas.

La Feria's F-M opposed-piston diesel, at upper right, with lube oil cooler, heat exchanger, and the temperature control valves for each.

La Feria's largest capacity pumping unit at right is a 6-cyl F-M diesel model 32E14 driving a double-suction centrifugal pump.



The main pumping station is on the river at Penitas, Texas, and discharges 202,500-gal per minute into 25-mi of dirt canal, 165-mi of open concrete canal, and 45-mi of underground concrete pipe. A gravity flow feeds all points along the main canal, which is 10-ft deep and 24-ft wide. The first delivery is made at McAllen, 15-mi from the pumping station.

District #1 began as La Lomita Irrigation and Construction Co. in 1907. In 1922 the landowners whom it served united and purchased the company and its facilities, including an old steam-driven pump, two relift stations and canal works. The group then petitioned the state water commission for necessary water rights and approval for a bond issue.

By 1926 both had been given, and a new pumping station was begun, as well as an extension of the existing canals. Six Fairbanks Morse type Y, style VA engines were installed in the newly constructed, reinforced concrete pumphouse, and the first water was pumped later that same year.

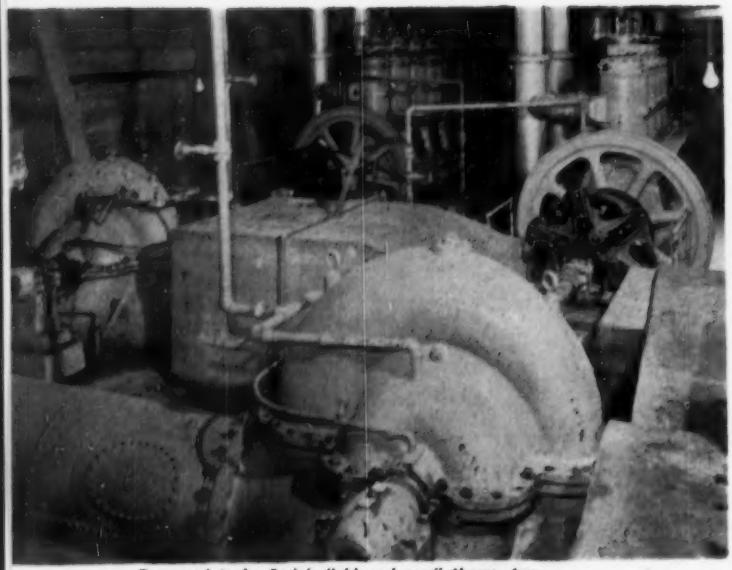
To finance these expenditures district #1 adopted a district tax system similar to those already in use in the valley. Each member landowner met three charges each year: a flat rate charge, according to the number of acres; a bond tax, levied in the same manner; and a water rate, levied each time a farm is watered and based upon the amount used. At present, each member pays a flat rate of $2.00 per acre per year, a bond tax of $2.50 per acre per year, and a water rate of $1.50 per acre per watering.

Since the average farm is 30 acres, total irrigation averages $405.00 for six waterings per year; however, a single laborer can water 12 acres in one day, working only with a hoe. The diesel engines do all the heavy work a lot cheaper.

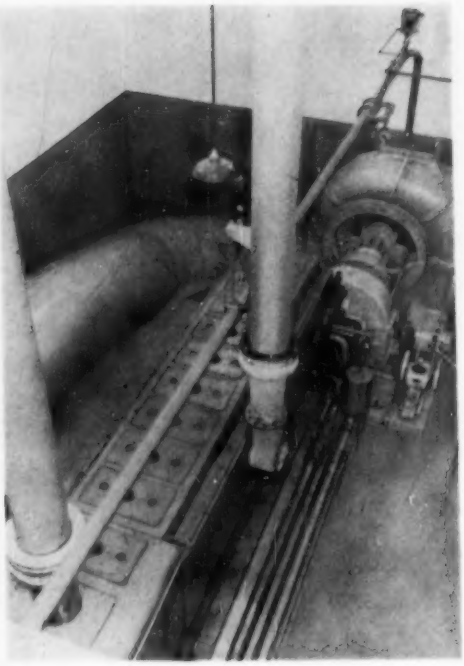
An elected five man board of directors hires a manager who actually directs the district's affairs. The district meets the irrigation needs of 35,000 acres, and in addition sells water to neighboring District #15, which has no pumping facilities.

Pumping Station Power

At the Penitas Pumping Station, Six F-M 360-hp type



To complete La Feria's "old and new" theme, two F-M type Y's, originally installed in 1918, are in service yet, operating at surprising economy.



At Harlingen, this 8-cyl F-M model 31AD8½ diesel engine drives a F-M double-suction centrifugal pump through a vertically offset reduction gear. Rate is 60,000-gpm.

Y engines had been in use since 1927. In 1952 they were removed one by one and replaced by an equal number of 8-cyl F-M Model 31AD8½ duel-fuel engines. These take advantage of low-cost natural gas and the 520-hp allows for the increased power requirements.

The new completely enclosed enbloc units are connected through vertical offset reduction gears to six F-M double suction centrifugal pumps. Equipped for 36-in suction and 30-in discharge, the 300-rpm rating is 33,800-gal per minute against a total head of 38-ft. The pumps take suction about one foot above the bottom of their suction bays, and require no protective screens.

The most recent fiscal report, through February 28, 1955, shows a district volume of 121,955.4 acre feet of water pumped at a total operating cost of $42,677.86, including pilot oil, gas, lube oil, station labor, and maintenance (labor and parts). This represents an average expense of 34.9¢ per acre foot. Fuel and lube together averaged a low 11.0¢ per acre, foot.

Here is to be found Penitas variation from the valley average. The newness of the pumping equipment and the efficiency of the diesel engines give them an edge. They are well below the valley norm in their operating costs.

In the twelve month period ending May 31, 1955, the six engines were in operation 47% of the time, recording 25,062 engine hours of service. They pumped 140,674.7 acre-feet of water and consumed 76,693.72 MCF of natural gas. This averaged just 545.1-cu ft per acre foot over an area of 50,000 acres.

Other pumping stations in the area use different diesel types and arrangements to answer their specific needs. For example, the Harlingen and La Feria stations employ examples of both the oldest and the newest in equipment, coupling four old F-M type Y's with two F-M model 38F5¼ opposed-piston engines. Originally installed in 1918 as "hot head" semi-diesels, the 37-year old engines are still used extensively and with surprising economy.

At La Feria during 1954, just prior to the installation of a new O-P in 1955, three type Y's (1918) a F-M model 32E14, 300-hp (1947) and a F-M model 32E14, 450-hp (1948) pumped a total of 84,230 acre-feet of water at a fuel cost of 18.9¢ per acre-foot. The new O-P was installed with the idea of further reducing costs.

Summary

Diesel-powered irrigation has proven to be worthwhile from both a commercial and an aesthetic standpoint. The line where the desert ends can be seen clearly—arid brown to the north and lush green to the south. The desert no longer dominates the scene.

The pattern of reclaiming wasteland by the use of diesel-powered irrigation is well established and has proven practical in many areas of our country. Here the Rio Grande Valley, through comprising only 1.6% of the state's total farm area, produces 7.4% of its total farm income. Before the 1951 freeze, from which the valley is still recovering, the figure was 11.0% of the total farm income.

It is a booming country, and it is interesting to note that effective irrigation is what made the difference to the land; and it is the diesel engine that made the difference to effective irrigation.

Electronic Analyzer Takes Engine's Pulse

Sperry's engine analyzer tells what's going on inside the engine while it's pulling its load. The indices are pressure, vibration, and in natural gas engines, ignition events.

IN that plane overhead they may well be checking out its engines in flight. The engineer can spot troubles at their start, even before they noticably affect engine operation. He does it with a Sperry engine analyzer, widely used by air-line operators, military organizations and business aircraft owners.

Apart from the all-important safety factor, this engine supervision gives the operators a dollars-and-cents bonus. Knowing what the trouble is and where it is reduces costly down-time. And if you think that your down-time is expensive, listen to this. A reported figure for one major type of 4-engine aircraft, based on 10-hr per day utilization, is $3500 per hour!

Sperry also brought the possibility of similar engine supervision right down on the ground. In fact, the latest model of their portable engine analyzer was specifically developed for electronic engine supervision of diesels and spark-ignited gas engines. It's a practical dynamic electronic maintenance tool for operators of stationary and industrial engines.

With radio and television here to stay, everyone has daily contact with electronics so there should be nothing awesome about the idea of an electronic analyzer as a maintenance tool. Actually, it is simple to operate and was designed to be used after only brief training by anyone familiar with the type of engines to which it is applied. No special radio or electronic skill is needed to run the tests.

While a new model analyzer is illustrated, the principle of electronic engine supervision is not brand new. Back at the June 14-17, 1954, Conference of the Oil and Gas Power Division, ASME, in Kansas City, J. E. Hart, technical superintendent of Kaiser Aluminum & Chemical Corporation's Chalmette, La., aluminum ore reduction plant, and E. A. Sammis, senior project engineer for Sperry Gyroscope Company, described their work with a similar but earlier-design analyzer.

Quoting from this paper, they state "This provides a means of effecting a significant reduction in the cost of operating spark-fired gas engines by facilitating quick and accurate adjustment during operation." They also said that the analyzer contributes ". . . towards the goal of engine overhaul based on knowledge of operating condition, rather than on . . . . engine time."

How It Works

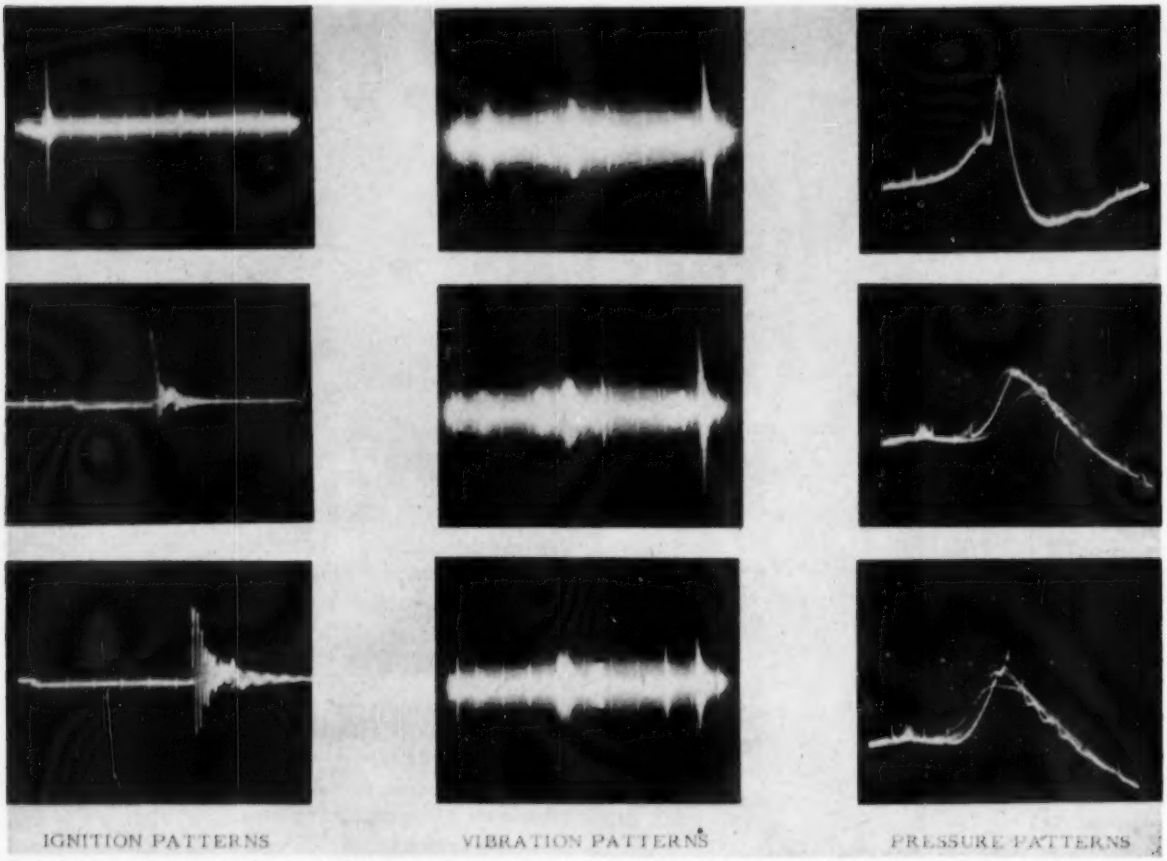
These analyzers are selectively responsive to three things—pressure, vibration, and electrical variations. Depending on how the analyzer is connected, the selected details of engine operation show up as voltage wave forms on a 5-in cathode ray indicator. They are seen at the precise instant that the events occur with respect to crankshaft position.

By observing and interpreting these patterns the operator can detect, locate and identify incipient troubles or faulty adjustments before they cause power loss or lead to engine damage. Adjustment can then be made and peak engine performance insured.

When you think of it, the use of electronics to monitor the dynamics of engine functioning is a natural evolution. It has its parallel in many fields. Even some house-heating systems are electronically supervised. With the ever-increasing engine speeds and pressures, the sensitivity, speed and accuracy of electronic instruments greatly increases the scope of dynamic engine tests that are possible.

Engine operation may be checked by analysis of cyclic pressures. Through the use of the Sperry rate-type pick-up, or commercially-available pick-ups with their associated pre-amplifiers, pressure analysis can be made for engine balancing and evaluation of power cylinder operation. The same is true for compressor cylinders on angle compressors.

Vibration pick-ups permit analysis of sounds in the engine structure. Combustion, mechanical knocks and seating of valves of all types produce characteristic vibrations in the surrounding structure. These appear as characteristic voltage wave forms on the viewing screen. Abnormal traces are readily apparent.



Typical patterns from gas engine in pipeline service. Top line shows slow sweep (360 deg); middle line, intermediate sweep (60 deg); bottom line, fast sweep (30 deg). Ignition patterns are normal. Slight pip at left (middle pattern) shows breaker point closing.

Large pip shows point opening. Middle and lower pressure patterns show cycle-to-cycle cylinder pressure changes. Small pip at left indicates ignition. Note indication of detonation in fast-sweep pattern. Horizontal reference line indicates 600 psi pressure.

By connection to the ignition system of spark-ignited gas engines, detailed analysis of the system can be made. The analyzer has been applied to a variety of systems including popular low-tension magneto systems and also the pulse generator type. Ignition events are shown as wave forms on the screen. Condition of and effect on the system of breaker points (where used) and the primary and secondary circuits can be determined by comparison with typical traces.

Timing of such events is also possible since the wave form is directly referred to crankshaft position by means of a timing pulse pick-up. Installation will vary with different engines but indication of position is taken directly from the crankshaft or flywheel. Accuracy is within one degree.

This provides a very accurate check on the timing of various engine functions while the engine is operating. For example, opening and closing of intake and exhaust valves or the opening and closing of ports in 2-cycle engines can be checked. The timing of fuel injection in diesels and the gas valve on gas engines are other possible check points. And of course, ignition timing in the latter type engines can also be verified.

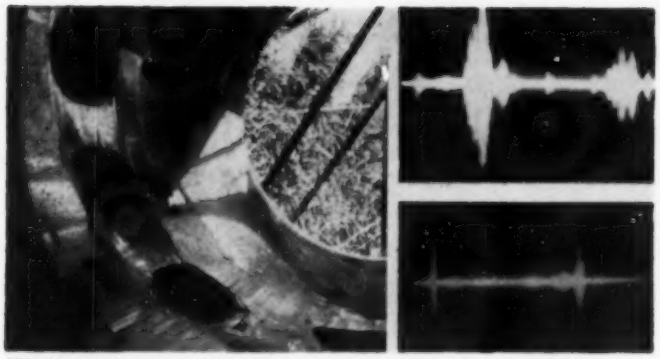
When working with either pressure, vibration or ignition patterns it is possible to select and expand the exact portion of the engine's cycle to be studied. First an automatic pattern length control feature adjusts pattern length to represent the same crank angle degrees per inch over a wide range engine speed.

Then, choice of sweep speed—fast, intermediate, or slow—alters pattern length horizontally to cover 30-deg, 60-deg or 360-deg of crank angle, respectively. Multipoint synchronization starts the pattern trace anywhere in the cycle. For checking ignition, the trace starts just before the spark plug impulse.

These features provide means for obtaining stable patterns of the particular item under study for detailed analysis. Dynamic timing of engine cycle events can be made to better than 1% accuracy.

Some Results

So far these analyzers have been used on diesels and gas engines principally in multi-engine installations such as the aluminum plants and pipe lines. They are used for regular maintenance inspection, for trouble-shooting improper operation, and as a tool for setting engines for optimum economy and output.



Vibration pattern (top right) taken on gas engine cylinder showed abnormal trace magnitude. Cylinder (left) showed cause—circumferential wear grooves in port belt. After correction, pattern (lower right) is normal.

Photo-recording pattern from aluminum plant engine. Aircraft-type analyzer seen was redesigned for stationary engine use after proven practical.

Tests have shown that the possibility of monitoring internal engine functions without disassembly for inspection permits engines to be run beyond normal inspection or overhaul periods with safety. Through pressure and vibration pick-ups abnormal internal conditions become apparent. This has eliminated a lot of down-time needed for examination or overhaul.

On the other hand, vibration analysis of an engine giving trouble has picked up such things as scored cylinders, enlarged ring grooves and clogged ports. In one case, very large amplitude signals were noted at 86-deg and 250 deg in one engine cylinder. This proved to be the result of a bad cylinder with circumferential grooves in the port area.

Note the pin-pointing of when the bottom ring hit the bad spot on the downstroke and the top ring hit it on the up stroke. This selectivity also applied in the case of an engine giving trouble after overhaul. Analysis put the finger on the fact that the camshaft was not properly timed to the crankshaft. Look at the time saved in locating and correcting the trouble.

Pressure analysis has shown conditions leading to cycle-to-cycle cylinder pressure variations. In gas engines this could be the start of detonation. When detonation does occur it is easily seen on the trace and an analysis can be made of the factors making the cylinder detonation-prone.

Spotting ignition troubles is equally important. During one two-month period the ignition systems of 31 engines were checked out. Conditions spotted included open coils, faulty timing, misaligned distributor rotors and crossed distributor leads. Location and correction of these faults, plus balancing cylinder loads to just below the detonation limit, resulted in an average power gain of 10.4%.

(With respect to the engine balancing by detonation limit, this was a procedure proposed by Messrs. Hart and Sammis in their 1954 OGP paper. Detonation limit in some cylinders is lower than in others, due to such factors as ignition system tolerances, differences in cylinder head clearances, unequal carbon deposits, etc. They proposed to set the gas valves on each cylinder to limit fuel delivery to just below the detonation point.

This type of balance disregards firing pressures and load balance among the cylinders. Some engine builders took exception to the procedure and it is admittedly controversial. However, the analyzer functions regardless of whether detonation-limit or load is used as a criterion in cylinder balancing. Test results given were obtained with the former method—Editor)

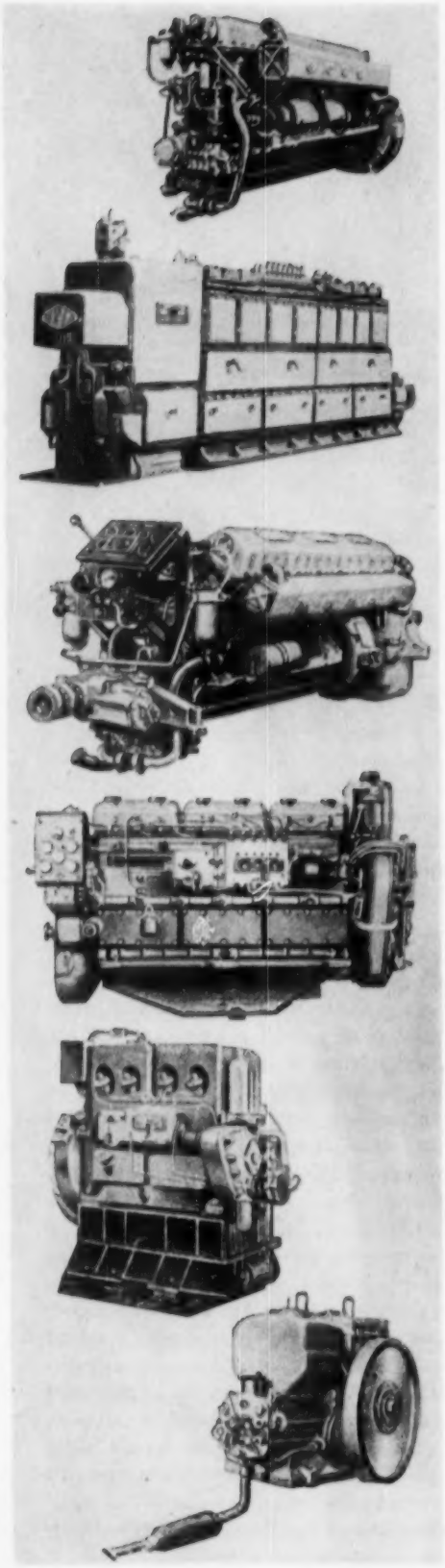
Use of the analyzer at an aluminum plant was aimed at improving operation. Engines were the Nordberg radials. Basically, there were three variables under direct operational control—gas valve timing, ignition timing and scavenging air pressure. The best combination for maximum economy with high output was sought. Repeated tests resulted in settings such that the load carried per unit increased from 93% to 102%. During the same period the heat rate dropped from 12,400 Btu to 11,500 Btu (both high heat value) per kw hr.

Summary

From the data given, it can be seen that the electronic analyzer can be an effective maintenance tool. It offers possibility of detailed analysis of a wide variety of engine functions under actual engine operating conditions and while the engine is working. No disassembly is required. Vibration pick-ups, for example, can be clamped or bolted to the engine close to the vibration source. All that may be required is to fasten the pick-up to a "C" clamp and attach it to a stud or bolt near the item to be checked. Occasionally a simple adapter may be necessary. It comes under the heading of "non-destructive" testing.

While the analyzer shown is brand new the principle is not. This latest model incorporates a new group of components designed with an eye to lowering manufacturing costs and hence the price tag. Use of the latest techniques (printed circuits, etc.) improved performance while retaining the system accuracy and dependability. Except for the power supply—amplifier, new components are compatible with earlier ones.

So the experience gained and the results obtained with earlier models accrues to this latest model.



D-6-5

D-30/50

ZD-12

6-CH-12/14

4-CH-10.5/13 2

T-62

Six Soviet diesel models placed on the foreign market. By comparison with western developments they appear too large and heavy for their power output.

USSR "Discovers" Diesels . . .

but lags in technology and production.

By Charles L. Adams

To compete for world trade, Russia must lift part of the Iron Curtain. Certain data immediately becomes available. Add to this the current tolerance for self-criticism in the Russian press and it has been possible for the author to piece together a picture of diesel development and production in Russia.

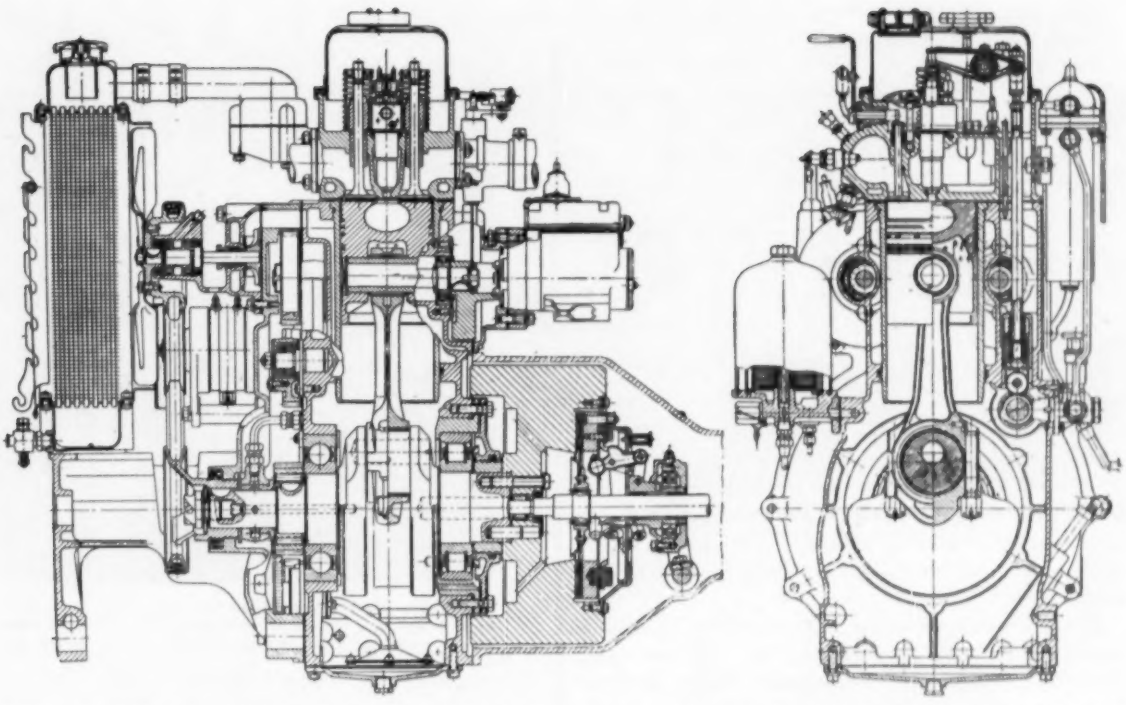
THE Soviet Union's mounting economic offensive against the West is bringing Russian diesel engines from behind the Iron Curtain and onto the world market.

Machinoexport, one of the USSR's leading trade agencies, is now offering a modest selection of diesel engines—stationary and marine, vertical and horizontal—to overseas customers. In advertisements appearing in Moscow-published foreign-language magazines, Machinoexport claims its diesels "embody the latest technical features, as well as high standards of design, workmanship and materials".

Russia's entry into the foreign market by no means indicates that diesel engines are now in surplus supply within the USSR. Quite the contrary, Soviet industry, transportation and agriculture continue to clamor for more and better diesels for their own use.

While revealing no specific figures, Russia's Central Statistical Administration has announced that the Ministry of Heavy Machine Building failed to achieve its production goals for diesel engines during 1954 and the first half of 1955. Domestic customers have also complained bitterly about the lack of variety and backwardness of design of Soviet diesels as compared with foreign models.

But the USSR's Ministry of Foreign Trade has ignored



Russia's new D-11 diesel replacing a 2-cyl gasoline engine in the KhTZ-7 tractor took five years to develop. Rated 14-hp at 1600 rpm with 15-1 compression ratio, it weighs 814 lb, is 31.3-in long, 19.8-in wide, and 35.1-in high. Injector looks familiar.

internal shortages of diesel engines, just as it has in the case of power plants, pumps and compressors, hoisting and transporting units, machine tools, instruments and even passenger cars. The ministry, unlike its "capitalist" competitors, is currently more interested in prestige and propaganda than profits and high sales volume.

As a result, Russia's comparatively-small volume of machinery exports is directed primarily at "underdeveloped" areas of the world. Machinoexport lists no prices for its diesel engines; but, on the basis of past performance, the tag will be attractive for the right customers. The USSR, for example, sells some of its automobiles (total output about 150,000 annually) abroad at half the domestic price.

Six models of Soviet diesel engines are offered to foreign customers in the latest Machinoexport advertisement. They include:

D-6-S—A vertical, 4-cycle, 6-cyl marine type, rated 113 hp at 1500 rpm.

D-30/50—A vertical, 2-cycle stationary type with four to six cylinders, rated 400-600 hp at 300 rpm.

ZD-12—A 4-cycle, 12-cyl, marine vee-type unit, rated 300 hp at 1500 rpm.

6-CH-12/14—A vertical, 4-cycle, 6-cyl stationary type, rated 80 hp at 1500 rpm.

4-CH 10.5/13 2—A vertical, 4-cycle, 4-cyl stationary type, rated 40 hp at 1500 rpm.

T-62—A horizontal, 4-cyle, 1-cyl type, rated 9-12 hp at 800-1200 rpm.

Despite its entry into the world market, Russia is seriously concerned over its failure to keep pace with leading western nations in diesel engine design and development. Much of this lag, Soviet leaders admit, can be traced to the Stalin regime, which emphasized steam and electric power and maintained that burning valuable gasoline or oil in internal combustion engines for non-military purposes is "as wasteful as making a fire with ruble banknotes."

Premier Nikolai Bulganin recently charged that the Russian Diesel Plant in Leningrad—one of the USSR's largest—"has been working on a new type of diesel engine for five years and still is unable to put it into production." He said that Soviet trucks and tractors are inferior to the best current foreign models in several important respects, such as fuel consumption, performance, weight and speed.

"Thus, for example, the Belorus diesel tractor, which has been produced since 1953 by the Minsk and other tractor factories, weighs three tons, whereas the British tractor of the same type, the 1951 Fordson Major, weighs two tons."

At the Vladimir Tractor Plant the kerosene-burning Universal tractor, first manufactured in 1924, was kept in production into 1955 without major change. Late last year it was finally replaced by the T-24 diesel tractor.

"This long-drawn-out case is very characteristic of the Ministry of Automobile, Tractor and Farm Machine Building," the newspaper Komsomolskaya Pravda declared. "It is evidence of inflexibility and lack of imagination on the part of ministry officials and plant managers who do

not want to lose production by changing over to new models."

Komsomolskaya Pravda said it has taken five years to plan a diesel to replace the gasoline-engine in the KhTZ-7 tractor "and even longer" for the VTZ tractor.

Bulganin asserted that "we (Russia) have been too slow in developing diesel locomotives. A number of serious measures must be taken in this matter."

The Soviet premier noted that there is great inefficiency at Russia's diesel-building plants, as a result of uneven output and lack of specialization.

During the first quarter of 1955, Leningrad's Russian Diesel Plant fulfilled its average monthly production plans as follows: First ten days, 5%; second 10 days, 23%; and third ten days, 72%. "How," Bulganin asked, "can one talk of rhythm in work at this plant when nearly three-fourths of the month's work is done in the last ten days?"

The official Communist party newspaper reports that Russian diesel output is now spread inefficiently among several machine-building industries and a wide variety of plants. One plant making diesel engines also turns out axe handles.

Russia has decreed strong measures to eliminate shortcomings at its diesel plants during its new (Sixth) Five Year Plan (1956-1960). It has also ordered sharp increases in output of diesel-powered ships, locomotives, tractors and trucks.

The last gasoline and kerosene-powered Russian tractors will soon be taken out of production. Whereas only 21.8% of the tractors manufactured in the USSR in 1940 and 75.6% of those manufactured in 1955 were diesels, 100% of the tractor models in quantity production will be diesel powered by the end of 1956.

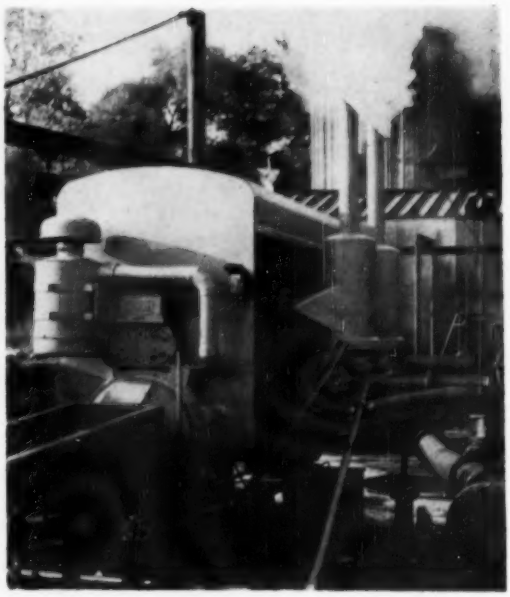
DIESELS POWER REFRIGERATION UNITS

(Continued from page 47)

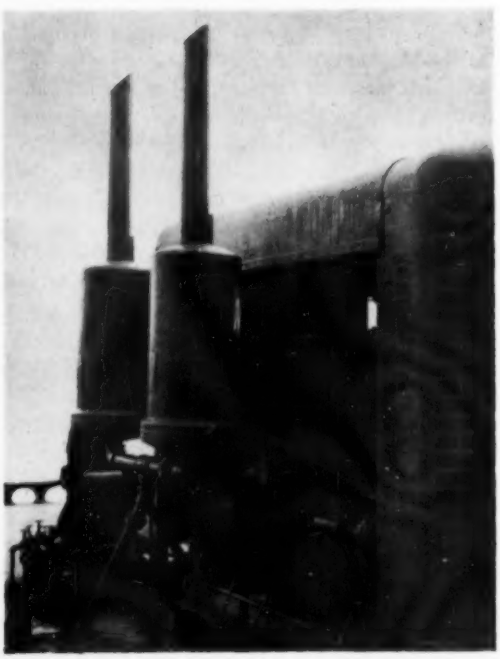
least 400 hours without refueling. Fuel tanks of 400 gal. capacity are standard. To insure that the car is functioning properly it is inspected at each in-transit icing station. These cars move in the same trains with ice refrigerated equipment which must make these stops in any event. If any of the mechanical equipment is not operating properly it is repaired by trained PFE personnel located at all strategic points.

By close adherence to the above programs the diesel power plant can safely operate five years or approximately 20,000 hours before a major engine overhaul will be necessary. This is the equivalent of 600,000 automotive miles per major overhaul.

Although mechanical refrigeration for railway use has developed quite rapidly during the past few years it is still in its infancy. Pacific Fruit Express Co. is constantly searching for more modern and more efficient equipment to offer its shippers low cost, safe and dependable service.



Water pump driven from engine fan belt pumps water from deck storage tank through exhaust pipe at left of each snubber. Water returns to tank through pipe at bottom of snubber.



Flow of water through the exhaust pipes leading into the snubbers can be started manually or automatically. Centrifugal action inside the snubbers removes the water.

Pumping Inflammable Liquids in Safety

Gasoline pumping on fuel barge is made safe from danger of flash fires by water-cooled, spark-arrester type Burgess-Manning exhaust snubbers.

Diesel-powered pumping unit equipped with water-cooled, spark arrester-type exhaust silencer works safely on gasoline barge.

WHEN power is needed in fire hazardous areas you can't beat the diesel. It has no ignition system and needs no electrical connections. The hot exhaust system is your only worry. But even this can be taken care of where necessary. As an example let's take a pumping unit transferring inflammable liquids.

Since the pump and hose are so close to the engine, the uncoupling or bursting of a line or any leak may cause the liquid to spray on the exhaust system. Since this exhaust system is the hottest external part of an engine there's a strong possibility that the inflammable vapors will ignite.

Another possibility is that a spark from the exhaust may contact vapors resulting from a leak. The devastating results of these flash fires which quickly get out of control don't have to be emphasized especially if the equipment is installed on a tanker or barge.

Since pumping equipment of this type is always in danger of causing these flash fires positive preventive steps must be taken. Keeping the exhaust system component and gas temperature down below the liquid's flash-point is the best way of avoiding these fires.

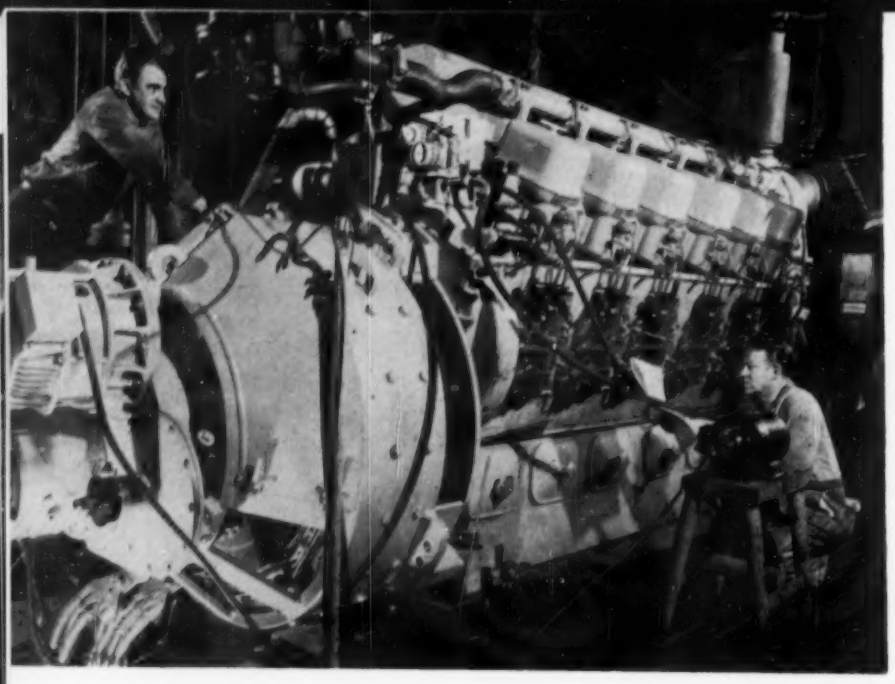
One piece of equipment doing a god job in this respect is a water separator snubber developed by the Burgess-Manning Co. This holds the exhaust temperature to safe limits. As the above term implies, water is circulated around the snubber to keep the temperature down.

In one case, where the pumping equipment is installed on a barge, a pump forces water from a storage tank on deck to the exhaust pipe directly ahead of the Burgess-Manning WSS-4 snubbers. This pump is driven from the engine fan belt. In this particular case the flow of water into the exhaust pipe is started manually. But it can also be done automatically.

After cutting down the temperature to the point where the exhaust in the tail pipe is between 200- and 244-deg F the water is removed by centrifugal action. This centrifugal action takes place inside the snubber itself and the water is returned to the water tank on deck. The water then recirculates through the system. Water temperature in this reservoir is between 160- to 180-deg F.

The comparatively cool exhaust gases leave from the top of the snubber whereas the water goes out the bottom. This well known counter-flow system of cooling makes the water cool the gases throughout the area of contact since the water, although heated, still meets gases which have a higher temperature than the water. Burgess-Manning tests have shown that gasoline sprayed on this water cooled exhaust system will not burn.

In addition to practically cutting out the fire hazard due to high exhaust system external temperature the WSS-4 snubbers are silencers which effectively reduce noise. They are also spark arresters which are a must not only on all marine installations but also in mines, residential districts and any other area where a constant threat of fire exists.



Each new engine is run a minimum of nine hours on a test stand under close supervision. Later, installed in a locomotive, it is given a second test on a waterbox.

Alco Builds New Vee-12 Diesel

Alco's latest vee-12 diesel, featuring a new-look in appearance and component design with an increase in power, will replace previous 1600-hp models for locomotives, oil-well drill rigs, and other applications.

ALCO has a new diesel engine. It is different from their previous models both in appearance and in the material and design of many major components. The first group of these new Model 251, 12-cyl, 1800-hp, turbocharged vee-engines are specifically for locomotive service.

They will be used in Alco's new-design DL-701 diesel locomotive just introduced. With this new engine the locomotive can run at speeds of 75- to 92-mph depending on the gear ratio used. But the Model 251 engine will also be available for powering oil-well drill rigs, pipeline pumping units, municipal plants and marine applications.

Having a 9-in bore and 10½-in stroke, this 1000-rpm engine is intended to replace Alco's 1600-hp Model 244 engines. The Model 251 engine has been on the design boards since Feb. 1951 and many refinements are built into it. These modifications have resulted in a 200-hp increase over the previous model. It is claimed that the new-but-proven parts used will have longer life with less maintenance. Many of the parts incorporated in this new engine have already been time tested in some of Alco's previous models. Here are some of the new features.

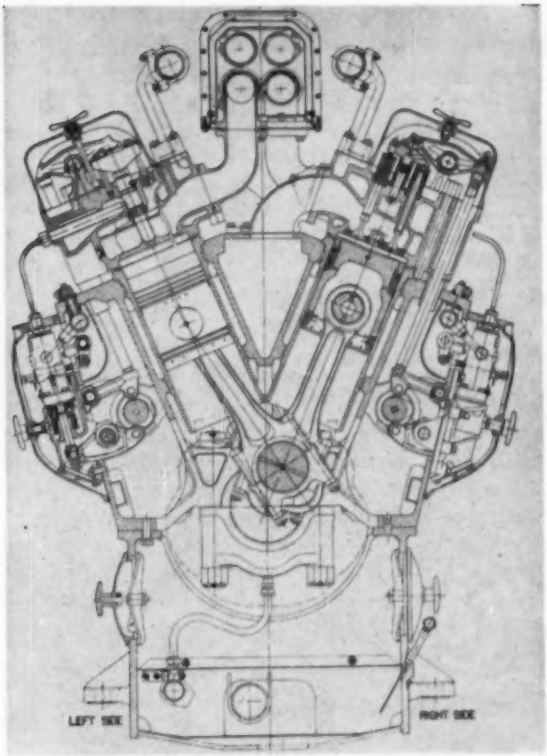
Engine Modifications

A major change is the elimination of the earlier camshaft idler gears, and the camshaft and free-end casings which are common to all older model Alco engines. With the camshaft now located inside the block both construction and maintenance are simplified.

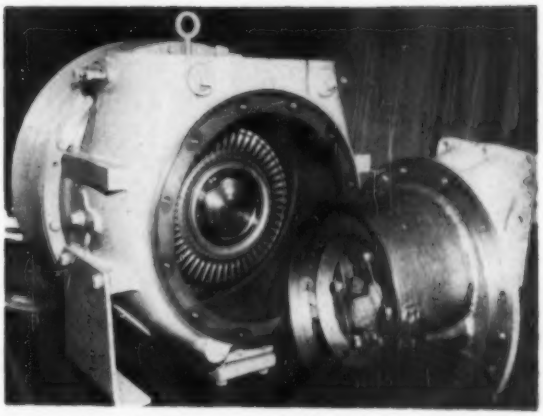
The cylinder block of the new engine is of the wet-type, and liners with integral water jackets are no longer used. This results in a simpler liner construction and more efficient cooling. The block is made stronger and heavier than that of previous Alco engines. The water in the block completely surrounds the wet-type cylinder liners and each liner is sealed with two "O" rings at the bottom and one at the top. All liner bores are chrome-plated for longer life.

Piston rings are specially heat treated to make them compatable with the chrome liners. Six rings, three for oil control, are used on an aluminum piston. The fire ring fits into a Ni-Resist groove insert at the top of the piston. The new insert was developed to provide a wear-resistant groove and lengthens considerably the time between piston renewals.

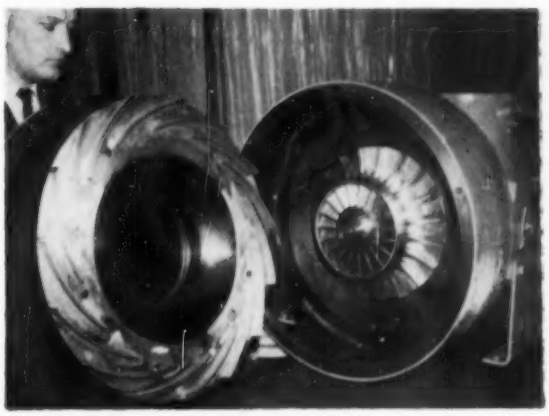
Alco tests have shown that if the aluminum backing of the Ni-Resist insert in not thick enough the ring carrier is weak and will probably crack. Therefore special attention has been given to the amount of aluminum behind the



Section through the "251" engine as seen from flywheel or generator end.



Alco's 500 turbocharger used on model 251 engine. Here housing containing nozzle ring is removed to show turbine wheel.



Opposite end of turbocharger with housing that forms part of volute removed. Compressor rotor is seen in turbocharger and diffuser blading on the housing.

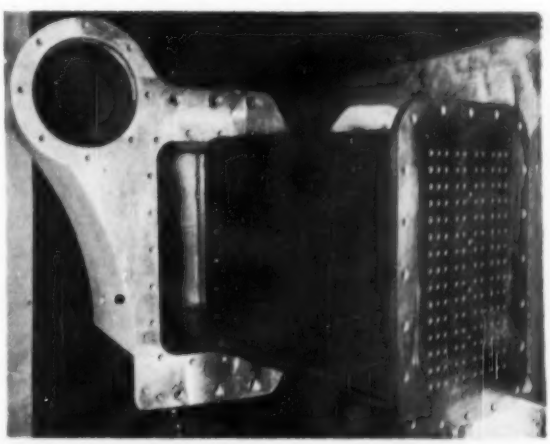
carrier. In addition, special locking of the insert in the carrier was designed to prevent loosening. Because of all these features Alco has liberalized its warranty of these pistons.

Although the crown of the new piston is flat, turbulance in this engine is obtained by shrouding one of the two intake valves. Other features in the new valve arrangement consist of Stellite valve-seat inserts and hardened valve faces for all valves. By the use of this material the life of the two intake and two exhaust valves is expected to be longer than those in previous models.

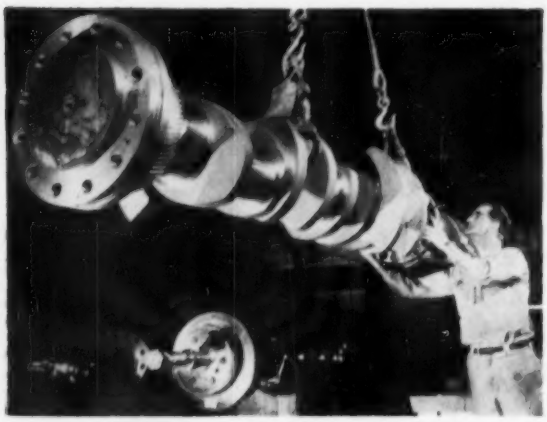
An air-intake aftercooler cools the air from the Alco built Model 500 water-cooled turbocharger before it enters the engine. This effectively reduces temperatures in all combustion-affected parts and produces a greater weight of air in the cylinders, lowers the mean cycle temperature and improves combustion. The use of the turbocharger thereby results in a higher mechanical and volumetric efficiency with better fuel economy.

The new fuel injection system consists of American Bosch Model APF pumps and multi-orifice nozzles. The pumps are so located and driven that no fuel leakage from them can find its way into the lube oil system.

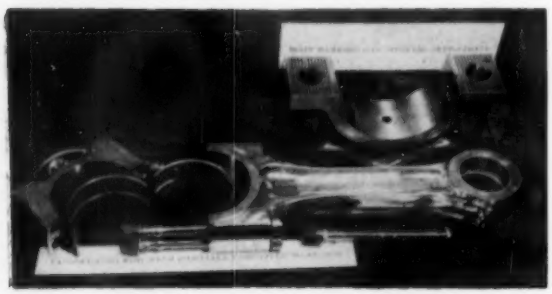
The amount of fuel injected by the pumps is controlled



Alco's aftercooler was designed to reduce substantially the temperature of the intake air leaving the turbocharger before it enters the engine valves.



Crankshaft is 13-in longer than in Alco's model 244 but connecting rod bearings are smaller. Here a shaft is being "miked" prior to installation.



Connecting rod assembly and main bearing cap of the "251". Note the highly finished surfaces of the assembly and the serations on the bearing cap to prevent it from shifting.

by a General Electric electro-hydraulic governor. This governor permits cleaner exhaust during acceleration. It also allows the engine to be thrown on the line in transit. A positive-action mechanical overspeed trip gives added safety to the unit.

The remaining new features deal with the crankshaft and bearings. This crankshaft is 13-in longer than that in Alco's 1600-hp, Model 244 engine but the connecting rod bearings are smaller. Grooveless main and connecting rod bearings increase oil-film thickness by more than 100% according to the company's figuring. This also results in better distribution throughout the bearing surface.

The center main bearing is wider and stronger than that of the Model 244. This gives lower unit pressures resulting in lower temperatures and longer life. The bearings are all of the precision-type. All main bearing caps and saddles mate with serrations. The purpose of the latter construction is to prevent shifting of the bearings.

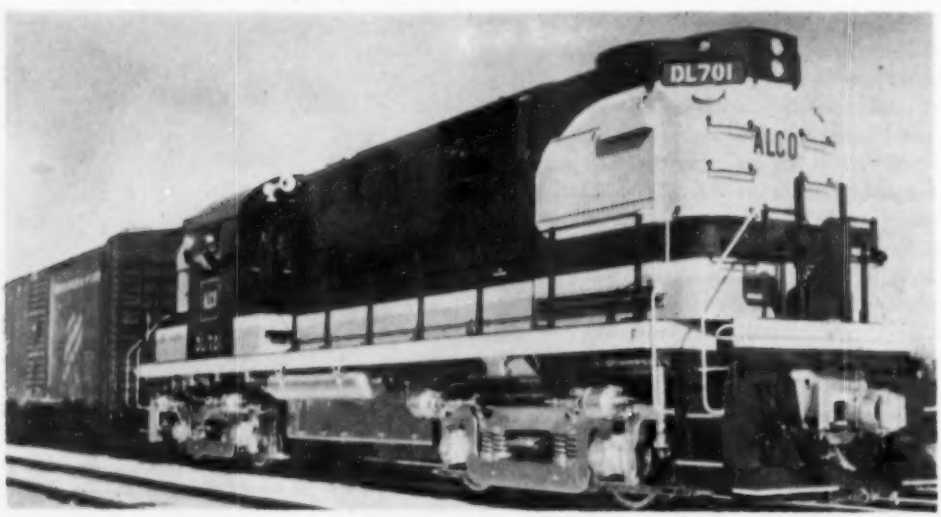
As mentioned before, the Model 251 has various applications but it is being used initially for locomotive service. As a matter of fact the first of these engines was installed in the Alco DL-701 prototype locomotive just introduced.

DL-701 Locomotive Features

This locomotive is distinctive for its high hood line, angle mounted number boxes and variable color, flush-mounted classification lights. Although the prototype has a long hood forward of the cab, Alco will build the locomotive with a short hood forward, placing the cab in forward motion, to conform to customers specifications.

The cab is longer than on previous models, it is weather-tight and has two heaters with fresh-air intakes. Dial-type gauges are placed near control locations to permit convenient operation of the locomotive in either direction.

First use of the "251" engine was in locomotives. Shown is the DL-701 equipped with the new engine.



The locomotive has a wheel base of 40-ft 4-in and is 14-ft 6-in high. It is 10-ft 1⅝-in wide and 56-ft 11¾-in long inside the knuckles. Roller-bearing trucks and a rubber draft gear are standard equipment. The locomotive's base weight is 240,000-lb but it can be ballasted to 260,000-lb. It is equipped with four heavy-duty GE electric motors for traction.

Electrical System Features

These motors get power from the diesel-driven, GE, 600-v, DC generator. A separate excitation system for this generator contains only one rotating machine, a 3-phase alternator with two slip rings and no commutator. It has positive inherent control of horsepower, voltage and tractive effort. The system's static control is contained in four dead-front interchangeable panels which can be quickly checked and replaced if defective.

Improvements in the basic electrical controls include a simplified engine control with individual push-button start and stop and a two-position engine-control switch with idle and run positions. The number of relays have been reduced leaving only tamper-proof, heavy-duty relays where required. A new ground relay has a trip signal and reset button accessible in the cab without opening compartment doors. A small auxiliary GE, DC generator provides lighting.

Modifications Available

In addition to the improvements mentioned above other modifications are available to meet customer specifications. Among these are gear ratios providing four choices of speed and tractive effort. Gearing at 65-mph produces a continuous maximum tractive effort 53,000-lb; at 75-mph, 46,000-lb; at 80-mph, 43,000-lb; and at 92-mph, 38,000-lb.

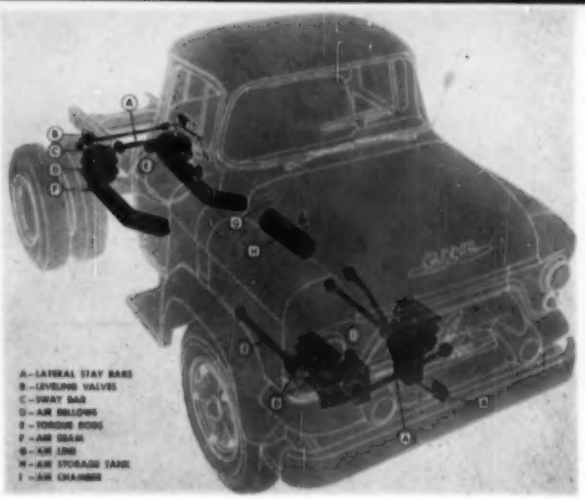
Another modification available is a dynamic brake system that is automatically controlled by non-moving devices. According to the company engineers it has the highest feasable braking capacity and a new blower motor circuit that insures against grid damage due to loss of air during a wheel slip.

Three steam generators are available with capacities of 1600, 2750, or 3500-lb per hr.

Conclusion

The Model 251 engine with all its modifications and refinements is another milestone in Alco's continuing program of engine improvement. They have succeeded in packing more power into a smaller, more efficient engine which promises to operate at lower cost with longer life and less maintenance.

This engine is adaptable for any application within its horsepower range. But seeing the growing need for replacement of older and obsolete types of diesel locomotives Alco is concentrating for the moment on the apparently more lucrative freight hauling business. Having about 100 of these new units already on order, Alco expects to sell around 350 of them this year.



Air Ride Suspension Coming For Trucks

DEVELOPMENT of the air ride suspension for GMC diesel trucks will introduce greater economy and efficiency in the trucking industry. This new type suspension has air-filled rubberized bellows replacing the conventional metal leaf springs. It is now on an experimental GMC truck-trailer combination but will be ready for production late this year.

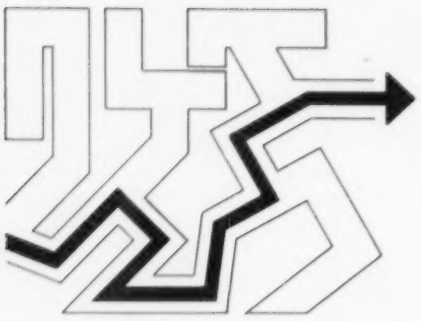
Over 400,000,000 miles of operating experience on GM coaches and tests with air-ride trucks show that air suspension has the following advantages over the leaf spring type. Spring lubrication, repairs and replacement are eliminated. A smoother ride is provided for the driver resulting in less fatigue. Breakage of fragile cargo is reduced permitting lighter-weight less-expensive packaging of goods.

Trailer payload capacity can be increased by lowering floor height. Loading and unloading is made easier by keeping floor at constant height. Chassis life is made longer and overall maintenance reduced. Better load distribution is obtained by keeping floor level. It also permits greater traction under the driving axle of tandem-axle combinations using a "dead" pusher or trailing axle.

The air suspension system on the experimental tractor-trailer combination consists of air bellows, leveling valves, air beams, air chambers and an air storage tank.

Compressed air flows from the storage tank to the leveling valves that meter the air into the bellows, air beams and air chambers. The suspension system gets air only when the air brake system has a safe pressure. Failure of the suspension system can't make the vehicle go out of control.

As trailer load increases the valves send air into the bellows. As it decreases, air is released thus keeping the bellows properly inflated at all times.



FILTER SENSE

By Robert C. Fashbaugh

A filter company representative out on the firing line adds a viewpoint to the series of articles currently being presented on the important subject of lube oil and filter change practices.

"WHEN should I change oil filters?" "How many miles should I run before I change oil?" "Should I change filters and oil together?" These and many other related questions are in the minds of operators and while the numerous recent articles help, in some cases the questions still go unanswered.

One reason for this is that some operators are looking for pat answers and there just aren't any. Each case is different and unless the operator has enough background on the whole subject, he has to get advice. This is where some confusion can start. It's all a question of who he asks and how objective the answers are.

Suppose he asks his lube oil supplier. Many oil company representatives will not make positive statements regarding filters either as a matter of policy or because their knowledge is just general in nature. Oil companies do not make filters. They may sell them in their service stations for automotive use but they don't make them for diesel operation. While their laboratories undoubtedly run tests involving different filters, a good many oil company people depend to a greater extent upon those of us who are in the filter manufacturing business to answer their questions. We do this and we can do the same for diesel operators.

Since, however, our business is *selling* filters, sometimes the operators do not give our opinions much consideration. One reason could be that it's rare for two filter representatives to come up with the same answer. The reason for this is simple. Each is selling his own product and there is a big difference in filters.

Filtration is a Complex Art

Some manufacturers, for example, use the same filter media for full-flow operation that they use for bypass or shunt systems. Some don't. Some manufacturers sell filter cases and sell their own element to fit the cases while others specialize in selling replacement elements. Some firms provide their product for standard equipment on an engine and their replacement elements are "factory" parts. Some outfits sell "price"; others sell "quality."

Actually, if you stop to consider all the factors, you realize that oil filtration is a highly complicated and exacting art. Only the objective is simple; to keep the lube oil acceptably clean. Some do it by straining or adsorbtive methods. Others use absorbtion as well as adsorbtion. Some filters use a chemical agent that coagulates the minute materials held in suspension in the detergent oils. Other filters depend upon a densely engineered media to catch the smaller micronic particles.

Filter manufacturers spend many thousand dollars to develop a marketable product. The business is highly competitive and overcrowded. Yet the demand for better filtration continues. Obviously, all of these varied ways of trying to do the same job mean that sizing, flow rates, pressure drops, hookups, etc., will also be different. This points out the need for a specialist in this field to give competent advice.

Operation is a Factor

Any filter representative, whether he be engineer or salesman, must consider many factors before he can make a definite statement in answer to the question, "When should *I* change filters?" One of the most important of these is the type of operation.

It's only common sense that the operator of a fleet making long distance runs on level highway will be able to run further on a filter than on one whose operating conditions are the opposite. It generally works out this way, provided that drivers of the same skill are used. The driver with the heavy foot, the lugger, can add engine wear, shorten filter life and generally knock your calculations into a cocked hat.

Do you have an engine that runs "dirty" and another of the same make and general condition that runs "clean" in about the same type of operation? Switch drivers and change filter elements at the same time. Watch the results; They'll probably surprise you.

Operation, driver skill, quality of maintenance—all have to be considered. And you have to get into the field to evaluate them properly.

Field Service at Work

As a representative of a filter manufacturer in a southwestern city I am called upon many times to give service to a fleet operator. Every aspect of his operation is considered and recommendations are made accordingly. Frequently I consult with an oil company engineer from the lube oil supplier and we consider the problem together.

This seems like a "conflict of interests". He is not averse to selling oil and as a filter representative I am interested in keeping the oil clean and in service longer. But unless you are teamed up with a pretty short-sighted individual, it works out. Generally, they realize that cutting an operator's costs is a good way of retaining an account.

I am frequently asked, "Does oil wear out?" The theoretical answer, of course, is "No", but as a practical matter, so many things can happen to oil that it is advisable to change it periodically. It gets dirty, dilution takes place and oil oxidation products, fuel soots, etc., promote deposit formation. I do feel, however, that oil life can be extended.

This can be done, and safely, by using the best in filtration and by use of regular tests. All of the better-known testing techniques can be used. The more complete and accurate the tests are, the further you can go with safety. However, with experience, the blotter method combined with an occasional laboratory test may serve the purpose.

In any event, with proper cooperation from the mechanics a filter representative can save you money and at the same time help you keep your equipment cleaner. Here is an actual case.

An operator with 35 units was changing oil at 2000 miles and filters at 4000 miles (this practice is widespread). Since some of his trucks were running "dirty", I was called in to investigate. We learned that the mechanic in charge was recommending more frequent oil changes. After checking the whole operation, I recommended an extended oil change period and more frequent filter changes.

The operator was finally convinced that he should change filters (a relatively inexpensive item) every 2000 miles and change oil (a major item) every 4000 miles. The fleet now runs on that schedule and oil tests show that the lube is cleaner at 4000 miles with the filter change at 2000 miles than it was at the end of the shorter drain period.

In this particular case it was found that the trucks were running on loaded filters before the 4000-mile change came up. The pressure drop was so high that little oil was going through the filter; most went unfiltered through the bypass. So oil was being changed because the filter couldn't remove any more contaminants.

Don't get the idea that all problems are this simple or that this solution necessarily applies to you. Each problem must be considered in the light of all the particular factors envolved.

In Conclusion

If you want the answers to your own problem on getting greater oil mileage or when to change filters, why not ask a qualified filter representative? Then take his advice. When you call one, make sure that you get the real thing. He may be a graduate engineer or more than likely a practical engineer with years of experience. In any event he will be a specialist.

He will represent a filter manufacturer and will be selling filtration and that alone. He won't be a salesman from a parts house with a thousand different items to keep in mind. You will probably find him listed in the yellow pages of the phone book as a manufacturers representative. He'll be busy since he will probably be working at least one and maybe several states.

He'll come to see you, though, and you'll get the benefit of this wide experience. He'll study your operation and make recommendations. If you listen he will probably save you money.

What Do You Know!

Here are some questions to test your general knowledge of the diesel field. Make your selections, then turn to Page 83 to check them.

1. Which one of the following factors does not necessarily determine how often a lube oil filter element should be changed in a diesel truck:
   a. Driver skill.
   b. SAE rating of the oil.
   c. Quality and capacity of filter.
   d. Method of hookup in relation to filter size.

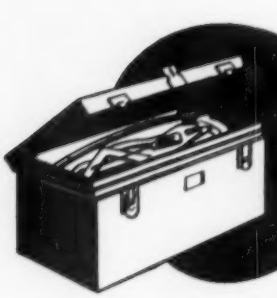
2. Residual fuels contain sulfur, vanadium and sodium compounds which contribute to corrosion and slag deposits. These can be removed by centrifuging.
   a. True b. False

3. In preparation for grouting under the base of an engine, tighten down:
   a. On all the foundation bolts around the engine to the proper torque.
   b. Only on the foundation bolts that are next to the jackscrews.
   c. Only on those foundation bolts located between the jackscrews.

4. The only purpose in cooling air after a turbocharger is to increase its density so that more fuel can be burned and higher horsepower obtained.
   a. True b. False

5. If you were moving a large engine mounted on skid beams by means of rollers under the beams you should place the tow line:
   a. Around the engine.
   b. Through the crankcase doors.
   c. Around the skid beams.

6. A spark ignited gas engine is in good mechanical condition, cylinder loads are balanced and all operating variables except load are held constant. If a severe overload is applied:
   a. All cylinders may start detonating together.
   b. One or two cylinders will start detonating first.



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

Magnets and the Delivery Valve

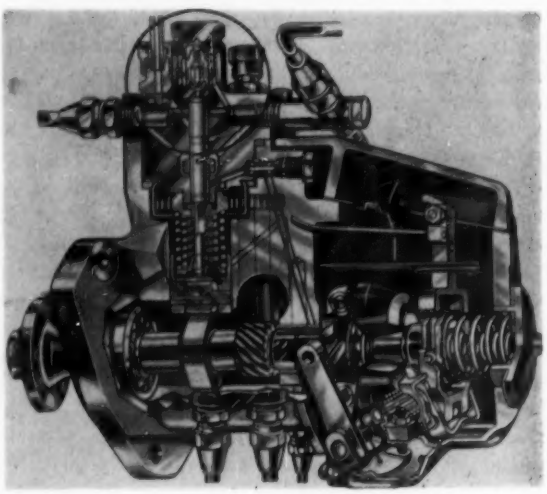
LEONARD F. GRIFFING, YAPHANK, NEW YORK—Ever since reading your article "Maintaining PSB Pumps and Governors on Waukesha Diesels", in the November 1955 issue, I have been meaning to write you about something that I wanted to pass along to you.

On page 60, you talk about what to do when an engine stops and won't start, and no fuel is being injected, you tell the steps needed to find out whether the trouble is in the pump. The first thing you said was to remove the delivery valve cover nut, valve spring and valve with a tweezers or magnet. I don't go along with this magnet idea, and I'll tell you why.

When you touch these parts with a magnet they will stay magnetized. Later on when the engine has run for a while, I have noticed that a sort of sludge builds up on the parts that you magnetized. You can see the same thing on those magnetic crankcase plugs. Things that would have gone through the system now stick, gum up the parts and cause wear.

As far as I'm concerned, using a magnet on any part of the fuel system is a serious matter.

This sounded reasonable to us, as we, too, have seen these sludge deposits around magnetic parts. To make sure, we checked with the manufacturer. Their service engineers prefer that the use of magnets in this kind of operation be avoided.—Editor



Cleaning Oil Passages

W. E. WARNER, WOODFORD GREEN, ESSEX, ENGLAND—I have run across a problem in clearing out obstructions in lube-oil passages, and I think my solution could be used by someone else. It works very well for me.

Sometimes pieces of lubricating oil piping or oil galleries in the block get fouled with hardened gums, tars and resins that will not come out with the normal engine cleaning methods. Frequently they are where you cannot rod or scrape them. When this happens I take a piece of thin, springy, steel wire and round off one end of it. The other end I put into the chuck of a hand drill.

Push the wire into the passage slowly as you rotate it by turning the drill. This will scoop the sludge off right at the wall and the rotating will let the wire go around any bends. The rounded end will not cut into the metal. After removing the wire, give the passage a thorough flushing to remove all the loosened material so that it does not harm the engine. I use this method every time the problem comes up, and it saves me an awful lot of trouble.

We agree that deposits on oil passages must be removed. This is one way of doing it. No engine is completely clean until plugs are removed and oil galleries free of sludge and hard deposits. Editor

news of our industry

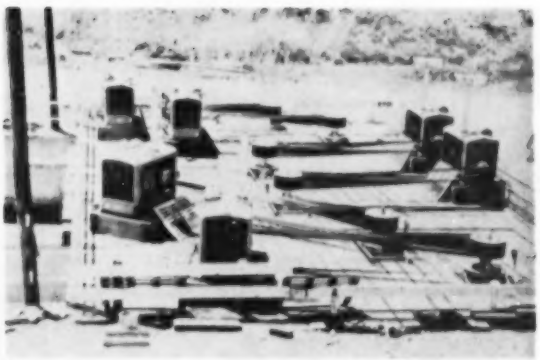
World's Largest Ditchdigger

Successfully completing its first field trial use in Findlay, Ohio, the Garwood-Buckeye 330 qualifies as the world's largest ditcher. A combination of 30-in tracks and 30-in pneumatic tires support and move the machine which excavates 600-cu yd of earth every hour. This is enough to fill a fleet of 60 large dump trucks. It cuts a trench 11-ft 3-in deep and 5-ft 4-in wide.

According to W. I. Crabiel, chief engineer at Garwood's Findlay Division, the 330 was designed to meet the need for a heavy duty pipeline ditcher that could also be adapted for deep sewer work. He rates the 330 eight times as efficient as a ¾-yd back hoe. And within the last few years there has been a definite trend toward larger and larger diameter pipeline construction.

This 53½-ft machine is powered by a 220-hp Caterpillar diesel engine driving through a torque converter to a unique arrangement of two Allison Torqmatic transmissions. These provide the speed ratios for the traction drives and 15 speed digging wheel drive. Shifting can be done regardless of torque capacities. Speed is controlled by lever type selectors operated without stopping forward drive or the digging wheel and the travel mechanism can be stopped for the digging wheel to operate and clean out the buckets. This last feature is valuable when digging under adverse conditions.

Despite the size and apparent complexity only one man is required to operate the machine.



Rubber Band V-Belts

As pictured, six large GM diesel engines with horizontal engine shafts are joined to six pump shafts which are vertical. Each pump unit operates on a quarter turn.

Joining each pump to its engine, nine 35-ft vee-belts are in place about a nine groove sheave on the engine drive shaft and another nine groove sheave on the pump shaft. The 24-in irrigation pumps themselves are recessed below the platform.

Water is pumped from Conchas Dam Reservoir near Tucumcari, N. M. at the rate 120,000-gal per minute, servicing 47,000 acres of drought threatened land. The pumping units were installed on a drought emergency contract from the U. S. Interior Department's Bureau of Reclamation which operates the irrigation project.

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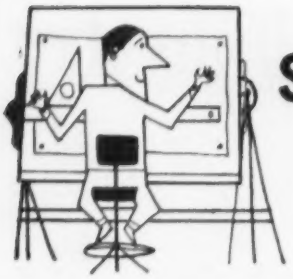


service section

Recent engine and equipment modifications, procedures and recommendations straight from the different manufacturers to you

P & H Add Piston Pin Plugs . . .

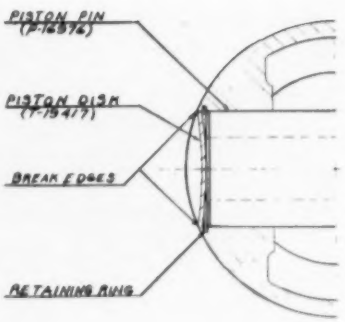
Plugs have been added to the piston assembly to prevent air box pressure from blowing into the crankcase past the piston pin. Two plugs, Part No. 19417, are required for each piston.

The plugs are pressed into the piston pin bore after the snap rings Part No. 11142 are in place. To obtain good results it is recommended that tool No. 316 5KT or equivalent be used.

The plugs are concave after installation. Any extension of sharp edges of the plug beyond the piston surface should be removed with a scraper.

To remove the plugs drill a hole in one and use this hole to pry it out. With one plug out, tap out the other with a rod or punch through the center of the piston pin.

The accompanying diagram shows the location of piston pin plug.



Alco—Improved Cylinder Heads—Model 244 Engine

A new cylinder head for the Alco Model 244 diesel engines has been developed which has been strengthened by increasing the cross section of certain portions of the head. The former standard cylinder head was strongest at the outboard exhaust section. The new cylinder head has been strengthened to give this same strength advantage to all critical points of the head.

At the same time the depth of the material around the valve ports was increased to accomodate valve seat inserts which are highly desirable. Stellite, a non-ferrous, extremely hard and wear resistant material was determined to be the best material for these valve seat inserts. Stellite is an interesting alloy which has the ability to maintain hardness and wear resistance at very high temperatures.

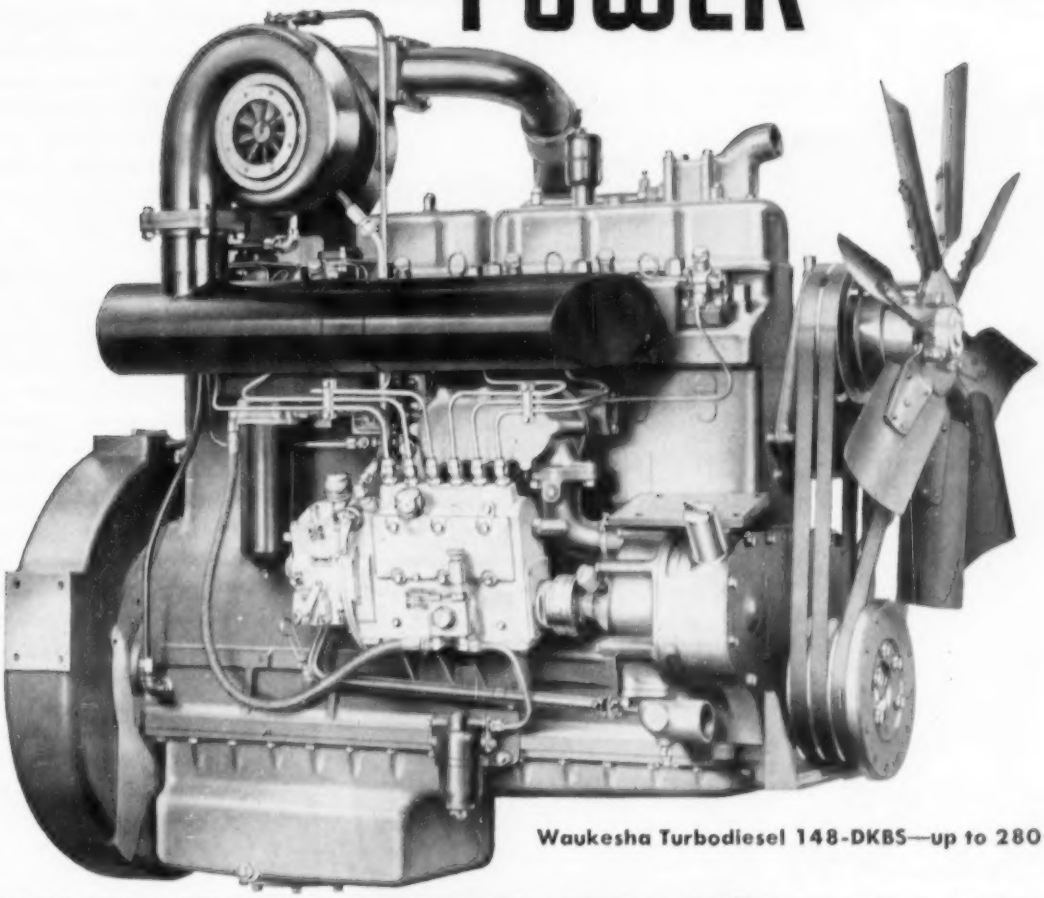
These inserts are prevented from pounding loose and falling out by a crimp-spring type retainer ring. Stellite valve seat and valve face wear has been greatly reduced due to superior compatibility of the two mating materials.

The use of a Stellite valve seat insert does not necessarily require the use of a special valve. However, to meet requirements of all conditions Alco will continue to offer its standard valve as sold in the past and at the same time also offer an alternate heavy duty valve which has a Stellite face and a chrome plated stem.

All new Alco cylinder heads have valve guides of the latest design with a longer bearing surface and a shorter counterbore. This improvement in the guide reduces the wear rate of the valve stem and guide bore assuring proper valve seating for longer periods.

The valves and cylinder heads discussed above may be ordered from the regional renewal parts warehouse by using the following catalog numbers: Cylinder head without the valve seat inserts, and valves, No. 2220016-5; Cylinder head with the valve seat inserts, but without valves, No. 22200111; Cylinder head with the Stellite valve seat inserts and Stellite faced valves with chrome plated stems, No. 22200211; Standard valve only, No. 2231122; Heavy-duty valve with Stellite face and chrome plated stem, No. 2231125.

MORE POWER TO YOU!



Waukesha Turbodiesel 148-DKBS—up to 280 hp

WAUKESHA Diesels

Compact, and power-packed—Waukesha 148-DKBS is a 6-cyl., 779 cu. in. Supercharged Diesel that has lively acceleration, clean burning, prompt starting, a tremendous reserve of power, and great overall economy. Waukesha's exhaust turbocharger system greatly increases horsepower—from 200 hp (of the normally aspirated 148-DKB) up to 280 hp at 2100 rpm in this Turbodiesel model. Send for Bulletin 1647.

WAUKESHA MOTOR COMPANY
Waukesha Wisconsin
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50th ANNIVERSARY Waukesha 1906-1956

300

TWO INEXPENSIVE WAYS TO PREVENT EXPENSIVE DAMAGE TO ENGINES

Blocks Lube Oil Failure and Engine Overheating

VERSATILE

Fulton Sylphon No. 539 Control automatically shuts down engine or actuates signal if (1) lube oil pressure drops below selected pressure, or (2) cooling water temperature exceeds value selected.

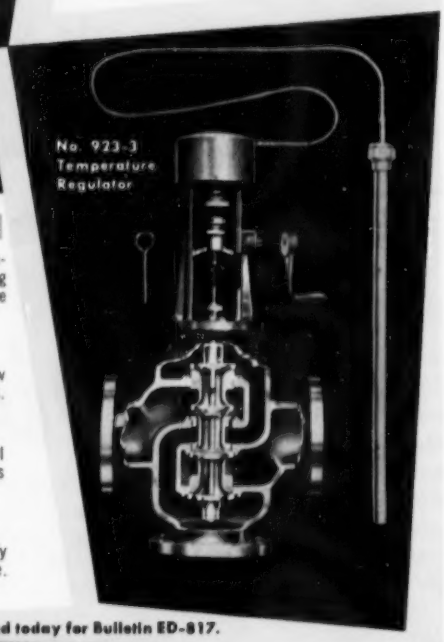
4 TYPES OF CONTROL

No. 539 (1) actuates signal only, (2) closes solenoid fuel valve only, (3) closes solenoid fuel valve and actuates signal, or (4) closes solenoid fuel valve and opens pilot relay.

SAFETY OPERATION

If thermostat fails for any reason, control automatically shuts off engine or actuates a warning signal.

Controls Jacket Water or Lube Oil Temperatures



OPERATES AUTOMATICALLY

This self-operated regulator automatically regulates flow of cooling water to hold jacket water or lube oil temperature at set value.

VALVE INDICATOR

Pointer moves along scale to show position of valve poppet at all times.

MANUAL OPERATOR

Turn of handle over-rides normal thermostatic operation and permits instant manual adjustment.

VARIETY OF VALVES

Valve sizes from ½" to 6". Body and trim metals for any service.

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news of our industry

Maintenance Cuts Expensive

New York, New Haven and Hartford Railroad, recently faced with complaints of poor service and delays on commuter runs, is now under fire from another angle. Connecticut's Public Utilities Commission recently stated in a report by Gov. Ribicoff that the cut in operating funds in 1954 (over 1953) had "contributed" to the poor performance. The cut was $11,503,000 and included maintenance funds.

Deferment of maintenance and purchase of new equipment has proven costly. Coupled with the recent flood damage it became a real problem. However, vigorous steps are now underway to correct the deficiencies.

The best approach, it was decided, involved both trackage and equipment. Increase in available trackage is planned. New equipment will ease the load on existing equipment and provide time for needed rehabilitation. Use of the new light-weight cars, some of which are to be double-decker commuter models, is expected to help. Also, 120 new diesel-electric locomotives, recently ordered at a cost of $20-million, are expected to start arriving soon.

Truck Tonnage Up

The volume of intercity freight transported by truck in 1955 was an average 13.7% better than 1954, reported the research department of the American Trucking Associations.

The Central region contributed the most total tonnage and the highest percentage of increase, 18.9%; but the Southern and Northwestern regions followed closely, each with a 15% increase. As was expected, the areas with strikes and floods—New England, the Rocky Mountains, and the Pacific Region—recorded the lowest gain.

Areas of highest gain — Central, Southern and Northwestern—are the regions where diesel transport is most used.

news of our industry

Gas Turbine Conference

The ASME has selected Washington, D. C. as the site for its first Gas Turbine Power Conference. Dates are April 16-18; place, the Hotel Statler. Approximately 500 engineers, scientists, and industrialists from the U. S. and Europe are expected to attend.

The program will include six sessions on industrial, marine, and aviation applications for the gas turbine prime mover. Recent work on rotary heat exchangers, with attendant improvements in gas turbine cycle efficiencies, will be included. A program highlight will be an inspection trip to the Naval Gun factory for demonstration of some of these applications. Gas turbines, their components, and associated equipment will be on display by major manufacturers.

Expanding Prosperity Increases Motor Transport

Transportation should expect a heavier load in the coming years, according to John P. McGill, public relations speaker of the American Trucking Association.

"We are in a long period of improving our standard of living", he said, "and expanded living standards mean increased production and consumption and hence increased transportation needs. Every form of transport . . . will reflect in their operations the drive for a better standard of living."

The trucking industry will unquestionably receive its share of the increase, which will be reflected in the increased use of diesels. Their economy of operation, important in competition, has already been recognized, as proven by the reports from vehicular diesel users.

Decentralization and the trend to suburban living will play a part, as well as "the assumption that there will be no important changes" in government regulations of the transportation industry, asserted the spokesman.

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MECHANICS STANDARD SERVICE SET No. 5166 GS-B

You can get a *Snap-on* tool set with the right kind of tools to fit your job needs exactly.

Snap-on assembles special tool sets for a wide range of industries including automotive, aviation, construction, mining, petroleum and railroad. Tools for each industry are chosen as a result of years of experience with users in each of these fields.

A complete set of the right, precision-made *Snap-on* tools saves hours of time — and puts an end to damage of parts caused by using loose-fitting makeshift tools. Each set fits neatly in a handsome, strongly-reinforced chest.

Write for your free catalog. Write today for your copy of the new *Snap-on* Catalog V, listing more than 4,000 hand and bench tools.

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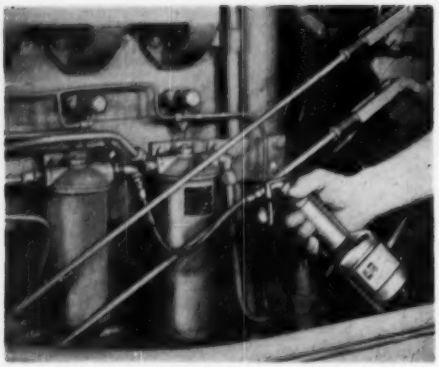
new products



Fuel System Primer for Hard Starting

The Kent-Moore Organization, Inc. has recently released the J-5956, a new fuel system primer for diesel engines. It is applicable to GM Detroit Diesel engines, Buda Diesel engines, and others.

Valuable as a starting aid after engine or head overhauls, the primer supplies fuel to the system before starting. It is said to eliminate danger of damage to the fuel injection system caused by attempting to start without adequate fuel throughout the system. Wear is also reduced on the starting mechanism, especially in cold weather.

Equipped with a filter, the primer tank holds approximately one quart of fuel.

Proto's Non-Conventional Tool Line

The Plomb Tool Co. acquisition of the essential machinery, tooling, patents and inventories of the Tubing Appliance Co. has added some 200 items to their line. The additions are specialized tools required to work in close quarters, over, under and around obstacles, and in deep recesses. They are expected to fill a big need among industry and government tool users.

Proto-Tac ratchet wrenches are made in four basic types—open socket, closed socket, crowfoot and "hytork". The complete line includes sets, ratchet heads, rigid heads, handles, sockets, universal joints, screwdriver attachments, and adapters for standard sockets. All are made from tough special steels.

One Man Drum Handler

A new, improved drum lift by means of which one man handles steel drums (55-gal and 30-gal), fibre drums (18-in to 23-in diameter) and acid carboys (13-gal) has been announced by Sterling Fleischman Co. It is said to save time and prevent injuries and accidents.

Made of all steel construction the lift is rated at 750-lb capacity. The lifting power, supplied through a foot-operated hydraulic jack, will raise a drum to a height of 53-in. The drums may be stacked two high vertically with impunity, for the center of gravity is said to be always maintained within the four spark-proof casters.

An outstanding feature of the lift is the easy-lock girdle which though attached in seconds holds the drum firmly. A brake holds any position or angle for rotating, mixing or pouring at any height.

THE BEST KNOWN GUIDE TO

Diesel Design . . .
Maintenance . . .
Operating Data

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Now in its brand *new*, 835 page, 9th Edition, the DIESEL ENGINEERING HANDBOOK is read by 55,000 top men in all industries building, servicing, or operating Diesels—Construction . . . Trucking . . . Stationary Installations . . . Marine Use . . . Railroading.

More than 900 separate Diesel topics are reviewed. Its 30 chapters analyze such vital Diesel subjects as:

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- *Cooling Systems*
- *Fuel Oil*
- *Diesel Lubrication*
- *Exhaust Systems*
- *Pistons & Rings*
- *Crankshafts & Bearings*
- *Supercharging*
- *Starting Systems*
- *Engine Air Systems*
- *Speed Governors*
- *Diesels By Make & Type*
- *High-Speed Diesels*
- *Marine Dieselization*
- *Dual-Fuel Engines*
- *Diesel Engine Specifications*
- —12,000 *Facts On* 1100 *Diesel Makes & Models*

Here's what the Automotive Engine Rebuilders Association Bulletin has to say of the DIESEL ENGINEERING HANDBOOK:

"The most complete and best known Diesel reference book . . . just the thing for the Diesel man, whether a beginner or veteran, who wants to have at hand, when he needs it, vital information and data."

Order *now*, and put it to work for YOU. You'll want to consult it every day—to keep abreast of the most efficient maintenance procedures . . . to know the construction details of every Diesel . . . to insure reduced equipment "down-time".

GUARANTEE—*If within 10 days of the time you receive the* DIESEL ENGINEERING HANDBOOK, *you find it will not help you, return it, and we'll gladly issue a full refund*

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YES, send me . . . copies of the *new* 9th Edition of the DIESEL ENGINEERING HANDBOOK @ $8.50 per copy ($9 outside U. S. & U. S. Territories). I have a *money-back guarantee* if not satisfied within 10 days of its arrival.

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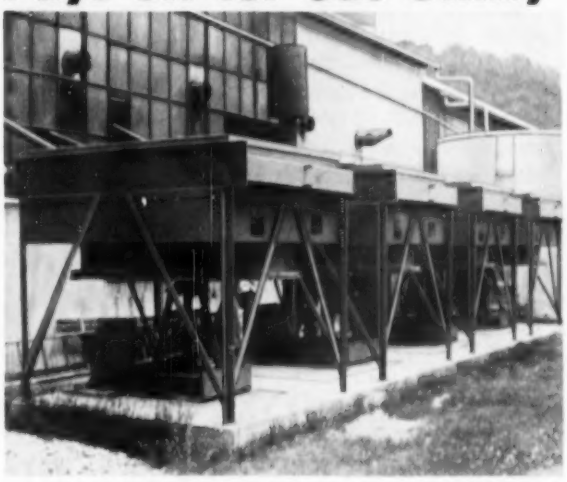
HB 3/6

Young *Engineering Talent*

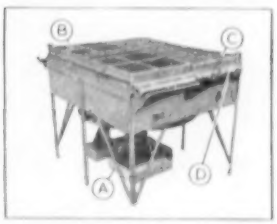
Pays off for Gas Utility*



*South Penn Natural Gas Co. Station, Smithfield, West Va.

Young "HC" Atmospheric Radiators

eliminate cooling water supply problems



The Problem: To replace an old cooling tower serving gas compressors. A nearby creek furnished the uncertain water supply.

How Young solved it

Young HC Horizontal Core Cooler and Condenser

Four Young Radiator Company HC Atmospheric Radiators were specified to cool four 165-hp compressor engines. Natural gas is compressed from local field lines and well-head to pressures suitable for shipping to distant sales points. Installation of the Young Units has modernized the compressor cooling system. In addition it has made the utility independent of the uncertain water supply.

A. Independent mounted fans eliminate unit vibration.
B. Coils designed for easy access to tube ends.
C. Coils supplied for any operating pressure.
D. Steel tanks treated for corrosion resistance.

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Put Young Talent to work for you . . .

Solving heat transfer problems is what we do best because it is our very reason for being. You, too, can harness the power of Young engineering talent. Write, wire or call without obligation.

HC is a registered trademark.

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RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS FOR INDUSTRY
Heat Transfer Products for Automotive, Aviation and Industrial Applications. Heating, Cooling, Air Conditioning Products for Home and Industry.
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

new products

All-Purpose Spray Gun

All sorts of jobs can be accomplished with its newly developed P-CGA spray gun, The DeVilbiss Co. announces. The tool, which made its debut at the recent Pacific Automotive Show, uses a limited amount of compressed air and may be converted from suction to pressure-type feed by flicking a knob.

Industrial Solvent

Vinsol is the trade name Speco, Inc. has given to its new metal cleaning agent, which it states has cleaning properties resembling carbon tet, but is 20 times less toxic. The maker advises that it can be safely used for virtually all applications, including those in confined areas, since it is non-flammable.

It is recommended for removing oil, grease, wax, and tars, and is said to be equally adaptable for cold cleaning, and dip cleaning.

ROCKFORD

New MORLIFE* CLUTCHES and CLUTCH PLATES Give—

MORE Clutch Life (400% MORE)
MORE Torque Capacity (100% MORE)
MORE Heat Resistance (50% MORE)

These *new* ROCKFORD Clutches and Clutch Plates have been developed by ROCKFORD Clutch Engineers to take full advantage of recently discovered facing material. Actual field tests on heavy duty equipment have resulted in adoption of MORLIFE clutches by builders of tractors, earth movers, graders, shovels, cranes, trucks, oil field equipment and power units. For information how these *new* Rockford MORLIFE Clutches will improve the operation and increase on-the-job hours of heavy duty machines, write Department E.

*TRADE MARK

"MORLIFE clutch has gone 851 hours without slipping or adjustment."

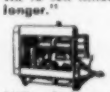
"MORLIFE clutch going strong after 1695 hours, working in sand."

"MORLIFE clutches last 950 hours longer, without adjustment."

"MORLIFE clutch needs adjustment once a month, instead of daily."

"MORLIFE requires lighter handle pull and one tenth the adjustments."

"MORLIFE pulls harder and lasts six to ten times longer."



"Won't buy a unit that isn't equipped with Durable MORLIFE clutch."

ROCKFORD Clutch Division BORG-WARNER
1301 Eighteenth Avenue, Rockford, Illinois, U.S.A.

CLUTCHES

Radially-Removable Coupling

Especially suited to installations which require radial removability is the C-R, a flexible coupling that is said to provide extremely easy assembly and disassembly. Manufactured by Lovejoy Flexible Coupling Co., the unit is lubrication-free and comes in six sizes ranging from 2.58 to 29.6 hp at 100 rpm. All feature reversible cushions so that their service life can be doubled on unidirectional loads.

The removability function is accomplished by special cushions cut so that they are held in position by a standard Type C collar when the coupling is assembled. When the collar is removed, the cushions can be removed, allowing the coupling half and connected shaft to be rotated. The intermeshing jaws slide into the stationary coupling half which is not removed. Disassembly is similarly accomplished.

Dial-Type Tank Gauge

To permit instant and direct reading of tank contents, The Liquidometer Corp. has developed Model D6, a dial-type gauge designed for fuel or water gauging on diesel locomotives, mechanical refrigerator cars, passenger cars, or any size or shape of fuel or water tank. It is said to offer improvements over sight glass gauges which may obscure accurate indication by fuel oil stains. Its fluorescent dial also facilitates night readings.

Dial indication is achieved by float actuation and direct mechanical linkage through a special bellows seal. This seal is said to entirely eliminate fuel and vapor leakage into the dial. Fuel loss and fire hazard are also obviated. Calibration is made in gallons. The float is of synthetic material, water and fuel proof, and the entire unit is ruggedly constructed for maintenance-free operation.

new products

10-Ton Capacity Lift Truck

Hyster Co. is now producing the largest of its lift truck models, the TC-200, of 20,000-lb lifting power at 24-in load centers. Factory installation of a Perkins P6 diesel engine is optional.

It has a travel speed above 20 mph either forward or reverse and has been equipped with vacuum-powered brakes. High maneuverability has been achieved by center-point steering and a sharp outside turning radius of 179 in. Compactness is a feature; the truck is a comparatively short 166½-in long and 94-in wide. Complete specifications are available.

Moncoil-Type 60-Cycle Rotor

Something new in rotor design is what Kato Engineering Co. claims for its 8-pole unit for a 60-cycle, 220/440-v, delta-connected, 3-phase generator. The company believes it to be the first 8-pole machine to be used with monocoil.

The generator will have a 10-kw rating at 900 rpm; the diesel to power the unit enabled to operate at very low speed. The rotor castings encompass the field coil and the entire armature has been coated with a high-grade varnish to make it one homogeneous mass.

Gas Welding Rod

A non-fuming, high-strength nickel-brass brazing rod for both joining and overlay with the oxy-acetylene process is the newest production of Ampco Metal, Inc. It is said to bond readily to a wide variety of copper, nickel, and iron-base metals and alloys, producing deposits silver-like in color.

Called Ampco-Braz No. 1, it is claimed to be excellent for building up bearings, etc., where a deposit having low coefficient of friction and good bearing qualities is essential.

Develop Silver Cadmium Cell

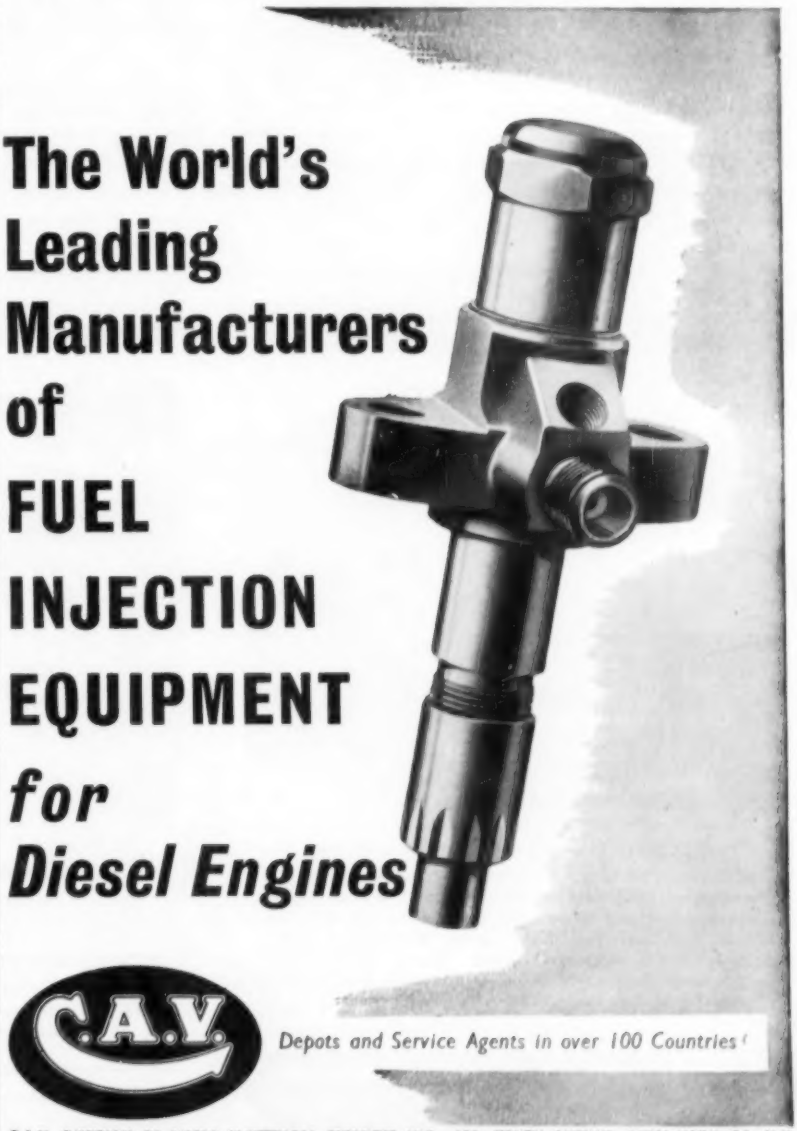
What is described as a revolutionary battery, combining the weight and size advantage of a silver-zinc couple with the long-life characteristic of a nickel-cadmium couple, has been announced by Yardney Electric Corp. Called the Silcad, the new battery substitutes silver for nickel in conjunction with a newly developed cadmium plate.

Long battery life, high capacity, low weight, and reduced size, are the claimed achievements.

Screw-Holding Driver

For driving small screws in restricted spaces, Kedman Co. has come out with a midget addition to its line of screwdrivers. This latest series will hold, start, and drive Nos. 0 to 4 wood screws and bolts and Nos. 2 to 4 sheet metal screws. The new series has a 3-in blade length with ⅛-in blade diam.

Called "Quick Wedge", each driver consists of two half-round steel blades which have been welded flat sides together into a plastic handle.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AP176-754

new literature

Users of Lubrication Pumps
and design engineers will be especially interested in a new catalog offered by Tuthill Pump Co. which covers its line of compact, cartridge-type lubrication pumps.

"Hypalon Chemical Rubber Booklet"
is eight pages published for industrial designers and engineers telling how to obtain rubber products with greater resistance to deterioration. Though no technical data is involved the Elastomers Division of E. I. du Pont de Nemours & Co. touch upon the composition and manufacture of this synthetic rubber. They show how its properties are advantageous to users of a wide variety of rubber products.

How to Use Solvent Detergents
for removing carbon, grease, dirt, and paint, is the topic of a 16-page illustrated booklet issued by Oakite Products, Inc. Four methods of application are detailed — manual, spray, tank, and machine.

A Basic Text for Safety
is the new expanded edition of the National Safety Council's accident prevention manual for industrial operations. More than three years of research went into this 1341-page encyclopedia which includes all information needed to organize a comprehensive safety program and keep it going. Every aspect of prevention is covered in its 43 sections. It sells for $13.50.

Hoses, Fittings, Couplings
the entire product line of Aeroquip Corp., is contained in a new 64-page catalog, illustrated and designed to be easily read. Full engineering data and answers to various problems encountered in different industries are included.

Space Saving Motor Control Center
with a 50% floor space saving is described in a 24 page bulletin of the Distribution Assemblies Department of the General Electric Company. Described is the construction and application of the general purpose motor control center, known as the type DA 7093. Listed also are ratings, weights, dimension, installation data and guide form specifications.

Photo, courtesy Kahlenberg Bros. Co., Two Rivers, Wisc.

Tuthill pumps are built for uninterrupted service. They're just the equipment you can trust for such vital jobs as positive lubrication on diesel engines and power units. The complete line of Tuthill positive displacement, internal-gear rotary pumps includes automatic reversing pumps and stripped models for built-in applications. We specialize in short runs of special pumps for engineered applications.

Write for data on Tuthill Lubrication Pumps.

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Dependable Rotary Pumps . . . since 1927
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- Nozzle Testers for American Bosch, Caterpillar and Bendix Nozzles
- Cummins Injector Tester
- International Harvester Injection Testers
- General Motors Injector Testers
- Injection Pump Calibrating Stands
- Nozzle-Injector Cleaning Tools and Lapping Blocks
- Engine Overhaul Stands
- Engine Removal and Parts Dollies
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76 Pages—275 Illustrations
56 Engine Reference Tables
26 Parts Lists

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KIENE® DIESEL
PRESSURE
INDICATOR

gives compression and firing pressures faster

SIMPLE
RELIABLE
COMPACT

Send for Bulletin K-100

The Model K-100 Kiene Pressure Indicator accurately measures compression and firing pressures — assures the proper maintenance of diesel engines — helps prevent costly down time. Only one moving part — no friction or inertia effects — no complicated adjustments.

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

new literature

"The Repair of Cast Iron Parts" is a four page fully illustrated booklet recently issued by the International Nickel Co. Nine case histories show the technique of welding cast iron with their companion electrodes, Ni-Rod and Ni-Rod "55". With their method, even welders of limited experience are said to obtain good results.

Corrosion Proofing Brochure detailed information on corrosion proofing materials and techniques as discussed in a field study by Pennsylvania Salt Manufacturing Company's Corrosion Engineering Department. Eight pages describe corrosion proof masonry construction and techniques based on thousands of installations, including linings in acid concentrators, stacks, pickling tanks, brick and tile floors, sumps, pits and trenches. Tables and charts are provided, as well as a section on protective coatings.

This is A-C from A to Z entitles a 24-page directory of product literature available from Allis-Chalmers Mfg. Co. A postage-prepaid card is contained for easy ordering of the literature desired.

Allis-Chalmers' Motor Grader is described in a two-color 16 page catalog. It explains design, engineering, construction and performance of the 50-hp. Model-D motor grader. Photographs, cut-aways and combustion graphs show the Model D's many features and also includes the engine specifications. Booklet number is MS-459.

Standard Clutches and clutch-coupling units are the subjects of an 8-page folder from Formsprag Co. Designed as a quick reference guide to the company's in-stock products, the folder contains photos, drawings, application suggestions, dimensions, and engineering data, as well as basic installation and maintenance instructions.

Hose Couplings and Nipples made of steel, malleable iron, and brass for industrial rubber hose, are comprehensively detailed in a color bulletin from Le-Hi Div., Hose Accessories Co. They are for suction, water, and petroleum applications.

905 More U. S.-Owned Patents available for private use on a royalty-free basis are described in the "Patent Abstract Series Supplement" just published by the Office of Technical Services. This supplement brings up to date the original 7-vol series distributed during the past 20 mo.

Atmospheric Corrosion Studies of non-ferrous metals, made by an ASTM committee, are presented in a symposium describing results of a 20-yr program of exposure tests. This was the most comprehensive test of these metals ever attempted and much valuable information is contained about the irrelative resistances. The 120-page book is available at $2.75 to non-members, $2 to ASTM members.

organizational news

D. G. Cummings

T. J. Angel

Appointment
of D. Gregg Cummings to the public relations staff of the Electro-Motive Division of GM was announced by Volney B. Fowler, director of public relations. Formerly merchandising specialist in the sales promotion section of the sales department, he is now in charge of exhibits and general information.

Appointments
in the sales department, Heavy Machinery Division of Nordberg Manufacturing Co. are: H. W. Dow, Jr., special representative; T. J. Angel, staff assistant to the VP; and R. P. McBride, district manager, St. Louis sales territory.

Elections at DeLuxe Products
have established Robert K. Ruland as vice president and general sales manager. He was most recently sales manager of DeKoven Mfg. Co., another Walker Mfg. Co. subsidiary, and in his new capacity will be responsible for distribution and sales of oil filters and cartridges.

Henry Schreck
designer of diesel engines and retired mechanical engineer has died at the age of 75. Shortly after coming to the U. S. in 1914, he became chief engineer of the Fulton Iron Works. Later he was diesel design engineer for Ingersoll-Rand Co., Fairbanks, Morse Co. and the American Locomotive Co. In 1946, he helped develop the 12-cyl 1600-hp locomotive diesel.

For his engineering skill in the reduction of theoretical concepts to engine design practices, and for contributions to modern diesel and compressor design he will be awarded posthumously a special citation by the Oil, Gas and Power Division of the ASME.

NOW... for the first time in the U.S.A.

MERLIN EQUIPMENT AVAILABLE!

To serve the many American companies who have asked for its world famous Diesel production and maintenance machinery, Merlin Engineering Co., Ltd. of England will build an American sales and service organization.

SHOW! Starting April 9th in New York City, the Merlin Servicemaster high precision grinder for fuel injector nozzles and needles, and the Merlin Calimaster for calibrating fuel pumps, and for other Merlin test equipment will be on display and demonstrated by Merlin engineers.

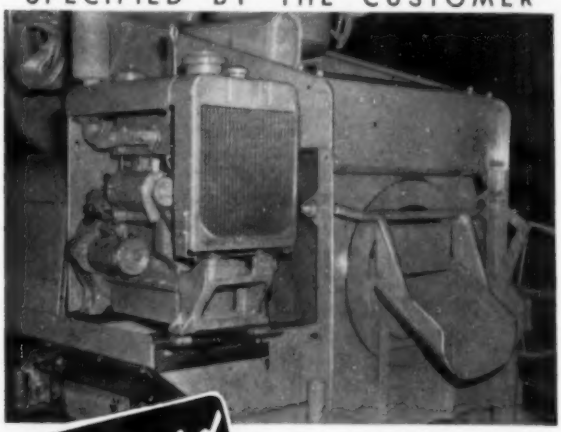
FRANCHISES! Distributors and Agents! Your customers recognize Merlin as tops in its field. Act on this unusual opportunity — write today! Please specify territory desired, types of customers served, sales coverage, etc.

MERLIN

For Show Appointments —
For Franchises — Write

MERLIN ENGINEERING
c/o C. A. Auffmordt & Co.
468 Fourth Avenue, New York 16, N. Y.

SPECIFIED BY THE CUSTOMER



Sheppard DIESEL 20 H.P. Model 17

30" HIGH
33" LONG
21" WIDE

Replaces Gasoline Engine on Concrete Mixer

With the Sheppard Model 17, the Chain Belt Co. was able to provide its contractor-customer with rugged, low-cost diesel power to meet his special needs. Only minor changes were needed to adapt the Model 17 to their standard machine. It will fit into your equipment with equal ease.

Goes into same space as standard engine used on Rex 118 Mixer.

for complete Model 17 data, write:
SHEPPARD DIESELS
HANOVER 4, PA.

BUILDERS OF DIESEL ENGINES, TRANSMISSIONS, REAR AXLES AND POWER STEERING UNITS FOR INDUSTRY

SILOO..

THE NATION'S NO. 1 DIESEL FUEL CONDITIONER

Recommended and Approved by Leading Diesel Manufacturers for Use in Diesel Tractors, Buses, Trucks and All Diesel Equipment

A proven necessity wherever diesels are used. Major cause of diesel trouble is brought about by natural tendency of diesel fuel to form gums and varnish. SILOO DIESEL FUEL CONDITIONER minimizes or prevents these formations. Keeps injectors clean. Eliminates hard starting, pounding, excessive smoking. Available in quarts, gallons, drums. Territories available. Write for details and Catalog C.

Petroleum Solvents Corporation
331 Madison Avenue, New York 17, N. Y.
In Canada:—Montreal, Que.

organizational news

Award

to D. H. Briggs, assistant service manager of GM's Detroit Diesel Engine Division, recognizes his twenty years association. The award is shown being presented by R. E. Hunter, Detroit Diesel's general sales manager.

D. H. Briggs R. E. Hunter

D. W. Radebaugh

New Sales Manager

D. W. Radebaugh has been appointed sales promotion manager of the Detroit Diesel Engine Division of GM.

Executive Appointments

at Waukesha Motor Co. include that of C. K. Jones to assistant manager of purchases; Melvin C. Erickson to chief engineer; and Paul E. Mantz to assistant sales and service manager.

Merlin U. S. Distributors

Merlin Engineering Co., Ltd. of England will set up their first U. S. dealerships this spring.

William E. Van Deusen

chief power plant engineer of the Rockville Centre Electric Utility, L. I. has passed away at the age of 52. He was an employee of the above utility since 1923 and became chief engineer in 1942. Much of the credit for the fine Municipal plant at Rockville Centre deservedly must go to Bill Van Deusen.

He was active in the affairs of the MEUA, was a member of the Rockville fire department, the 100F, Rotory Club and the RVC Employees Civil Service Association. His devotion, both to his duties and his hobbies, will long be remembered by those who knew him.

W. E. Van Deusen

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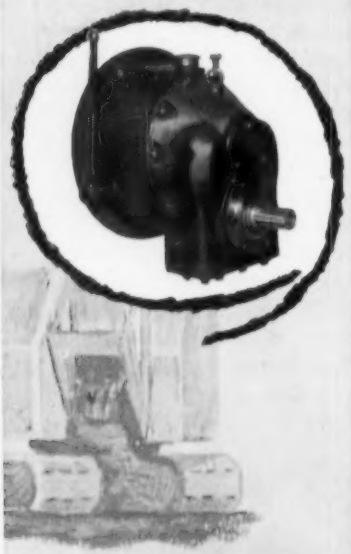
REDUCTION GEARS

POWER A DIESEL OR GASOLINE INDUSTRIAL ENGINE with S-N REDUCTION GEARS and Power Cut-Off Clutch

Regardless of the type of heavy duty equipment you are powering . . . there's a S-N Model and gear ratio to do the job — faster, and more economically. Seven models available. Remember S-N Reduction Gear Units insure smooth, full power from engine to load with maximum economy. Ideal for original equipment and all types of engines from 40 H. P. to 750 H. P. giants. Reduction ratios start at 1.5:1 and step-up to 4:1 in standard ratios. New catalog sheets are available.



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Transmission Engineers
FOR HALF A CENTURY
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news of our industry

OGP Holds New Orleans Meeting

The Oil and Gas Power Division of the American Society of Mechanical engineers is holding its 28th Annual Conference and Exhibit at the Jung Hotel, New Orleans, April 1-5.

This year's program, as in the past, is tailored to the major interests of the locality in the field of diesels, dual-fuel and natural gas engines. While there is good technical "meat" for everyone, portions of the program are slanted to cover technical phases of power for the petroleum industry and the marine industry, with particular emphasis on river towboats.

In addition to technical papers on a variety of important subjects, two Panel Discussions will be held. Recognizing the importance of hydraulic drives, one will deal with application and performance of torque converters and fluid couplings. The second will be on the subject of "Marine Engine Maintenance."

OGP's Special Lecture will deal with the various requirements and applications of oil and gas power in the petroleum industry.

Also included in the events is an inspection trip to the Higgins, Inc. shipyard where opportunity will be provided to see the marine construction in progress.

There will be a good number of interesting exhibits showing the latest products that have contributed so much to the industry's improved technology. Interest in the exhibits is evidenced by the fact that, as at the past several meetings, booth space was a sellout.

Add to this an interspersing of social events including a fine Ladies Program and it makes an interesting and instructive program. A detailed program can be obtained from the American Society of Mechanical Engineers, 29 West 39th St., New York, N. Y.

VIKING PUMPS + GOOD PIPING = GOOD PUMPING

Positive displacement pumps with smooth, even discharge like you will get with all Viking pumps . . . plus ample size piping with least number of bends and elbows . . . means good pumping at lowest cost, on either thick or thin liquids.

If you are looking for these results, specify Viking. To start, send today for Bulletin 56Sd.

VIKING PUMP CO.
CEDAR FALLS, IOWA, U.S.A.
In Canada it's "*ROTO-KING*" Pumps
SEE OUR CATALOG IN SWEETS

news of our industry

Diesels Set Up Proving Ground

Three miles northwest of Romeo, Mich., over 3½ million yards of earth have been moved on a 4000-acre proving ground now under construction for Ford Motor Co. The former farm land will be used to test-prove Ford's products.

Earthmoving for the project included clearing and large cuts and fills. Sandy soils of all types were encountered. Caterpillar DW21s, diesel engines for lighting, 27 D8s, and other Cat equipment provided the power.

Three test and endurance tracks have been laid out. One is a high-speed oval track 5-mi long, paved, and with a 2½-mi long straight stretch. The other two tracks are blacktop and gravel. Over 31 miles of road have been prepared, including the mileage of the tracks. Work was conducted 20 hr per day, seven days a week.

White Expands in Canada

New headquarters for White Motor Co. of Canada are being constructed in Toronto to house complete sales and service facilities. Expected to be completed in August, it will be a 42,000-sq ft building representing a 35% increase in the company's investment in plant and equipment.

GM Alters Dealer Agreements

GM prexy Harlow H. Curtice announced important changes in selling agreements with both car and truck dealers, to become effective in March.

The changes are the results of a survey of dealer problems in their respective areas, and "the changes and new clauses are designed to improve the inherent equities in the dealer contract", Curtice stated.

The modifications were unanimously approved by the dealer council, which represented all 18,000 GM dealers.

THE USS GLACIER *the largest and most powerful ice breaker afloat is*

BRIGGS EQUIPPED

LIKE MANY other marine installations, know-how and experience play a vital part in the performance of vessels doing rugged jobs requiring minimum service during long and efficient sea duty.

AS MAJOR SUPPLIERS to the United States and Royal Canadian Navies, we are in a position to offer practical and proved answers to many and varied marine lube and fuel filtration problems.

Photo Courtesy U. S. Navy

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What Do You Know!

(*Answers to Questions on Page 63*)

1. Correct answer is "b". Driver skill, quality and capacity of the filter and the method by which the filter is tied into the system all are major factors determining how quickly a filter element will get dirty enough to require replacement. See article on Page 62.

2. Correct answer is "b". Sulfur, vanadium and sodium compounds are usually oil soluable and therefore can't be removed by centrifuging. One way of making them harmless however is by use of an additive which raises their melting point high enough so that they don't break down in the cylinder but pass out harmlessly out the exhaust. See Page 44.

3. Correct answer is "b". All foundation bolts other than those next to the jack screws should be left slack until after grouting. Tightening them before grouting tends to deflect the engine base and introduce undesirable stresses. See article on Page 36.

4. Correct answer is "b". One of the main reasons for cooling intake air after a turbocharger is to keep down the engine's mean cycle temperature. In that way the engine parts would be subjected to temperatures no higher than they were designed for. See article on Page 58.

5. Correct answer is "c". Placing the tow line around the engine or through the crankcase doors may result in pulling the engine right off the skids if the rollers hang up. But it's more likely that the engine itself will be damaged if the wire slips. See Page 36.

6. Correct answer is "b". Such factors as ignition system tolerances, differences in cylinder head clearances, unequal carbon deposits on the piston crowns, etc., make some cylinders detonation-prone. See article on Page 51.

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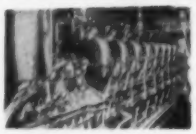

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news of our industry

Cummins Ups Engine Output

An immediate 21% increase over current levels in engine production has been announced by R. E. Huthsteiner, president of Cummins Engine Co., Inc. He stated that about 10% more factory employees are needed to accomplish this production increase which will raise the daily engine rate to the highest point in the company's history.

Reasons advanced by Mr. Huthsteiner for the increase, show the trend in the industry. They are that diesels are taking a larger share of total engine sales in the on-highway trucking market, a major field of the company, and that the construction industry, another major market, is anticipating long-range expansion. Other increase reasons were the development by the firm of a complete line of turbocharged diesels and its expanded program of manufacturing vital components such as turbochargers, pistons, liners, and camshafts, all of which had previously been purchased.

Commenting on last year's business, he stated that sales were about 30% above the levels of the year before. The company, he added, has an engine order backlog considerably greater than six months ago. Mr. Huthsteiner then announced that Cummins is developing a new line of turbocharged engines to enable it to keep pace with competitive manufacturers.

Kent-Moore Expands

Within the next six months Kent-Moore expects to occupy its new half million dollar building in the Detroit area. Increased diesel engine production has prompted the expansion.

The extension became necessary due to the need for new and more special tools to do operations previously difficult or impossible. The emphasis will be on the manufacture of custom tools to do specific jobs.

Because of the desirability of such tooling in the field by major companies such as GM, International Harvester, Allis-Chalmers, Continental Motors, and many others, cooperation has been excellent.

REA Conference Set for April

This year marks the seventh gathering of REA members for their annual electric generating plant operation and maintenance conference. It will take place at the Melbourne Hotel, St. Louis, Mo., from April 2-5. It will not be restricted to REA cooperatives; delegates from municipalities and utilities are invited. There will be sessions for both steam and diesel plants.

Tentative program for diesel men includes an electrical panel on breakers and relays; an inspection trip through a Shell Oil Co. refinery; water treatment discussion; economic loading of units and stations; atomic power; safety; turbocharger operation and maintenance; gas session; water tables and their effect on planning; and air preparation.

Mack Builds in Canada

Mack Trucks of Canada, Montreal, is constructing a $1 million headquarters in that city to contain what it claims will be the largest heavy-duty truck service in Canada. It will cover 46,000 sq ft on a 250,000 sq ft site.

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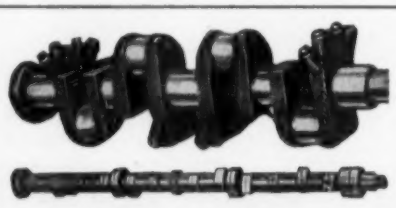

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D. C. Cooper Co. has patented an automatic conveyorized machine which is said to give complete automation to metal cleaning and dipping operations. It is designed for metal cleaning with petroleum solvents, alkalies, emulsion cleaners, and other commercial cleaning and paint stripping solutions. It also performs rinsing, rustproofing, and various preparatory and coating operations.

The machine is furnished in various sizes to handle all operations. Small parts are cleaned in baskets which are conveyed from one tank to another, and large parts such as castings and engine blocks are individually cleaned and conveyed through the various stages. Parts are loaded flush with the top of the machine at a normal working height to eliminate heavy lifting and immersion of the operator's hands in the chemicals.

Operation is accomplished by pressing a button, which action automatically lowers the loaded rack to the bottom of the machine. After the desired agitation cycle, another button is pressed and the loaded rack rises for the next operation. Where complete automation is required, machines are available with solenoid relays and cam-operated timers. Others can be equipped for soak-cleaning in addition to agitation.

Each machine has a deadman's control in addition to automatic fusible closing devices on its covers. They are all claimed to be profitable for use in the smallest shop where only periodic cleaning is required as well as for the largest industrial plants. Heated and unheated models are available in addition to non-conveyor types where only one or two machines are required.

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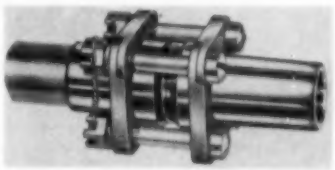

Tubing Connector

Now being offered for general industrial use by Barco Mfg. Co. is its split-flange connector, a special design used on aircraft and ordnance equipment to keep hydraulic tubing connections leak-proof regardless of shock or vibration. It is said to be incapable of loosening because it is unaffected by twisting and turning of the tubing. A further claimed advantage is its compact design to permit installation or removal in restricted space.

In the simplest connection, that of joining flared end tubing to a part with a tapered shoulder, the connector consists of a pair of split flanges, one sleeve with a shoulder, and four bolts, nuts, and lock washers. The split flanges are locked, one on the fared end tubing and the other on the tapered end part, and are then tightened by the bolts and nuts. For extreme vibration applications, a wirelock may be used with the lock washers. The connector may be used for hydraulics, steam, and gases.

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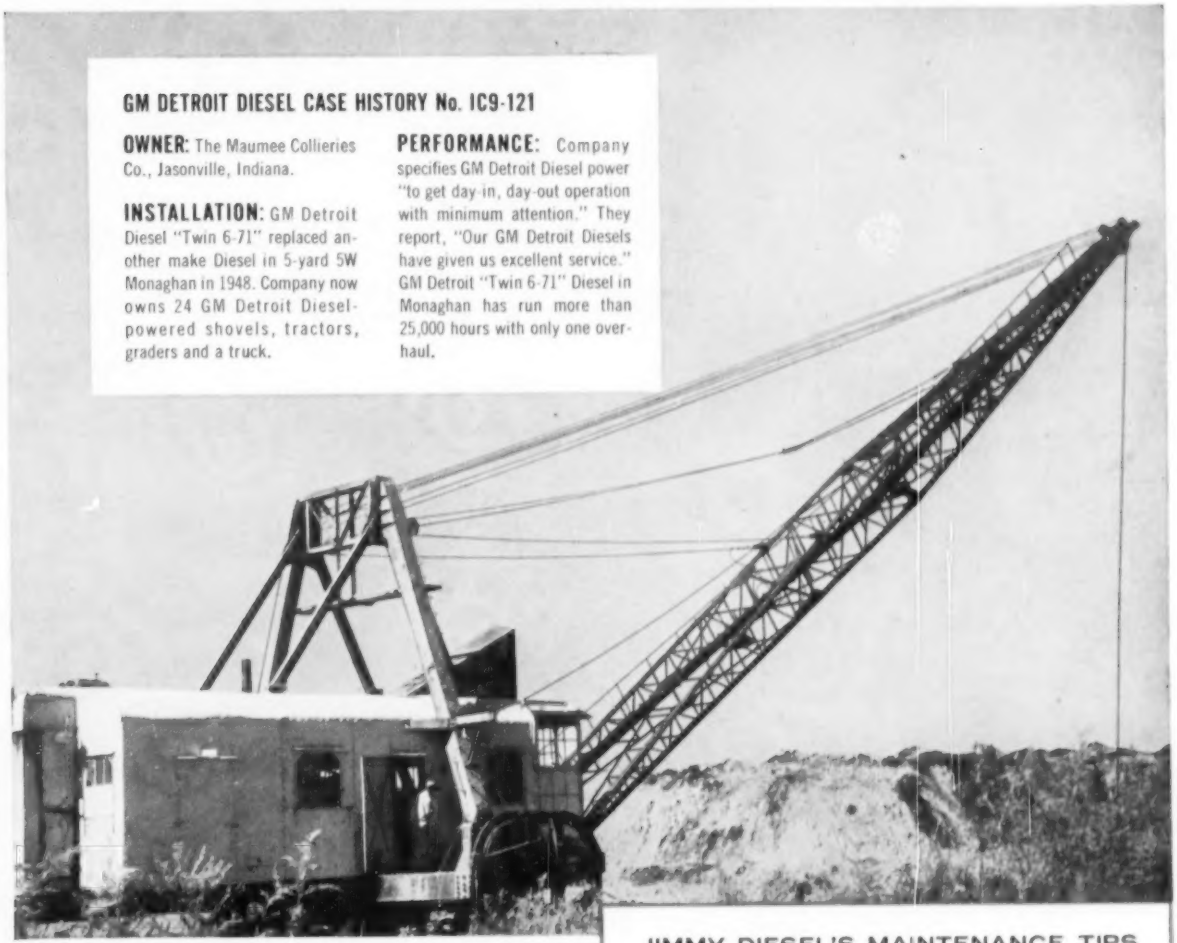

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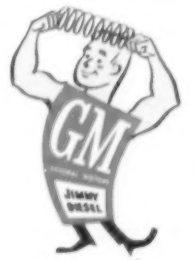

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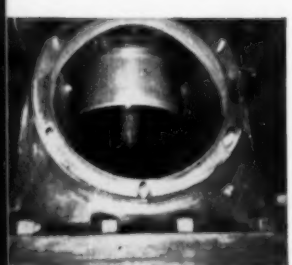
The plant averages 4.3 million HP hours of operation annually. Before changing to STANDARD D&G Oil, ports had to be cleaned several times a year. Now, with STANDARD D&G Oil in the engines, ports aren't touched between annual overhauls. Ring sticking and piston and cylinder deposits are virtually eliminated. All of this has been accomplished while continuing the use of low cetane, low gravity fuel.

Good management, careful maintenance and STANDARD D&G Oil have teamed to deliver this performance at Graettinger. Maybe you would like to use STANDARD D&G Oil to obtain similar performance from your engines. A Standard Oil lubrication specialist is nearby in any of the 15 Midwest and Rocky Mountain states ready to show you. Call him. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.



Piston of one of F-M engines at Graettinger Light Plant. STANDARD D&G Oil has kept maintenance down, cut piston and liner wear.

Standard man Bob Spargo (left) and plant superintendent Melvin Nissen inspect piston through crankcase inspection plate hole. With STANDARD D&G Oil, light plant has cut oil consumption in half.

Quick facts about STANDARD D&G OIL	
1	Made from highest-quality solvent-refined stock.
2	Contains additives which impart superior detergent-dispersant and anti-corrosion properties.
3	Anti-foaming.
4	Oxidation resistant.
5	Recommended for use (1) with economy fuels, (2) in extreme-load and/or low temperature service.

STANDARD

STANDARD OIL COMPANY
(Indiana)